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SEPTEMBER 1, 1948

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Simplifying Radial Engine Cam Design

Studebaker's Ultra-Modern Truck Plant

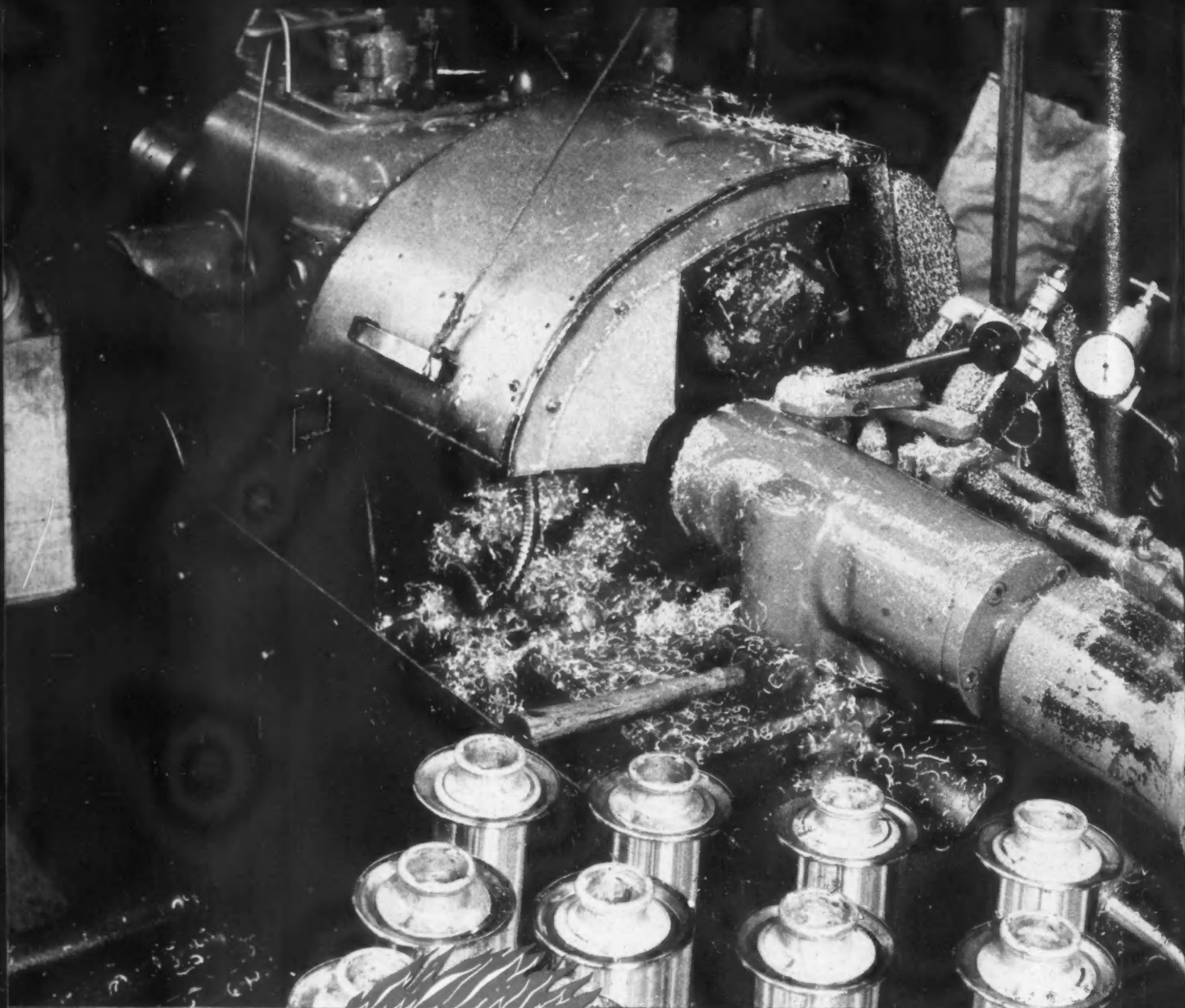
New Type Hollow Steel Propeller Blade

Survey of Pricing Policies Under Way

GMC's New Engine Plant in Full Operation

Big National Instrument Exposition

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Takes off the *HEAT* in magnesium machining

FIVE OR SIX FIRES were started every day by burning magnesium chips in a midwest metalworking plant. Not only was plant safety jeopardized, but valuable production time was used to combat the frequent blazes.

The trouble occurred when solid cylinders of magnesium were machined into bobbins. The largest of these bobbins, or textile spools, are six feet in length with a cylinder diameter of one foot and a rim diameter of two feet.

One cutting oil after another was tried on this "hot" machining job. They all failed to reduce the number of fires until Stanicut 62 FC was tested in one machine. Stanicut solved the problem and has since been installed in all the machines. After six months of service, it has not only eliminated all fires but also has increased tool life and improved the finish on the bobbins.

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Stanicut 62 FC

STANDARD OIL COMPANY (INDIANA)



AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

September 1, 1948

Vol. 99, No. 5

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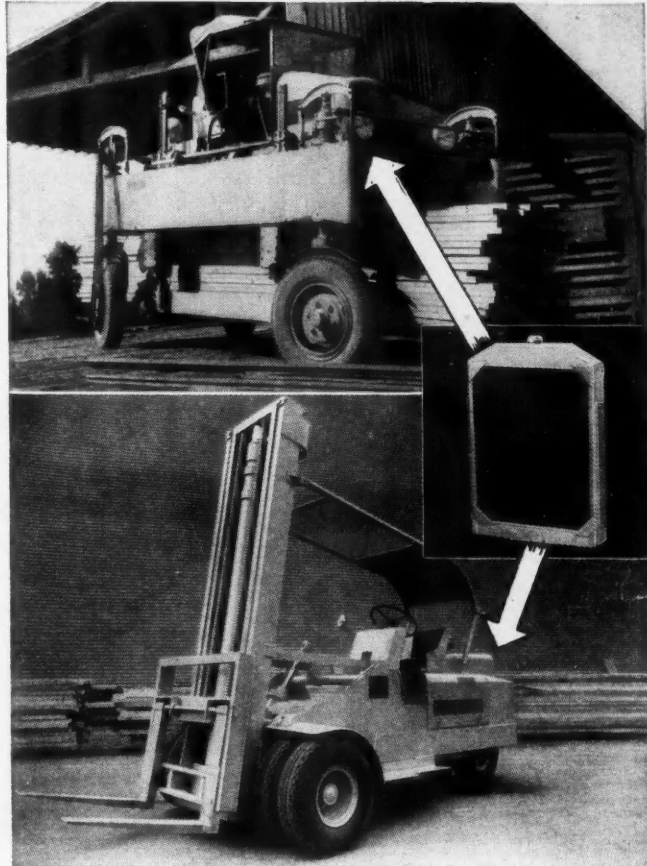
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September 1, 1948

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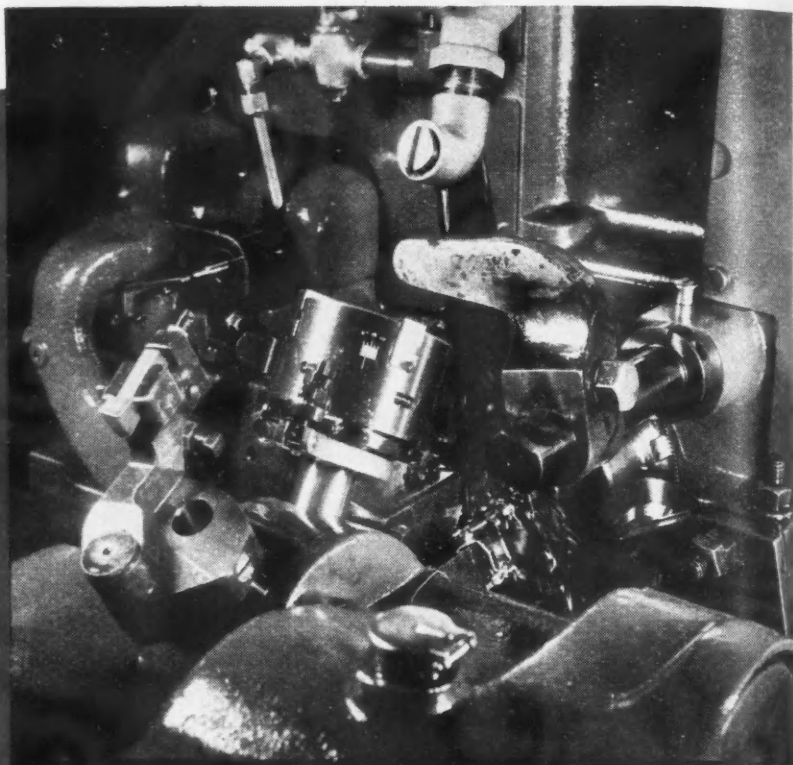
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**AUTOMOTIVE
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High Spots of This Issue

Studebaker's '49 Trucks Built in Ultra-Modern Plant

This immense modern plant features the utmost in streamlined conveyerization, spraying booths, drying ovens, and other equipment typical of Motordom's dramatic mechanization to meet production on America's second 100-million motor vehicles. The article appears on page 25.

Radial Engine Cam Design Simplified

In the first of two parts this article presents results establishing relationships in variable factors having a wide range in cam computations. It makes "must" reading for designers wishing to reduce the tedium of trial and error in computing proportions respecting lobe height and radii of multilobed ring cams. Begin it on page 28.

New Type Hollow Steel Propeller Blade

Certain weight savings and operating economies found in the development of a new type hollow steel screw propeller are interesting aeronautical engineers and military airmen. How an unusual combination of materials and fabricating methods overcomes former drawbacks in hollow blade construction is found on page 32.

GMC's New Engine Plant In Full Production

The self-contained engine building of GMC's Truck and Coach Div. is so located as to considerably eliminate use of freight elevators and ramps. The high output of gasoline and diesel engines resulting from the Company's modern equipment and efficient arrangement is explained on page 36.

Modern Trends in Instrumentation

Three timely articles, coinciding with the event of the big Instrument Conference in Philadelphia, Sept. 13-17, discuss some modern trends in instrumentation, the economies which instrumentation is bringing to automobile production, and the rigid demands which scientific instruments are fulfilling in aircraft inspection. Turn to pages 39, 40 and 41.

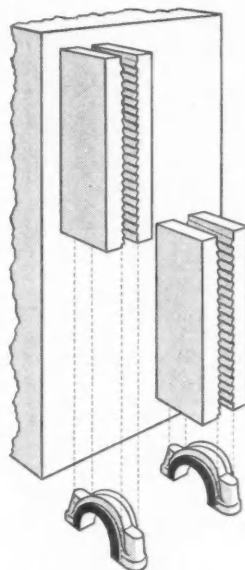
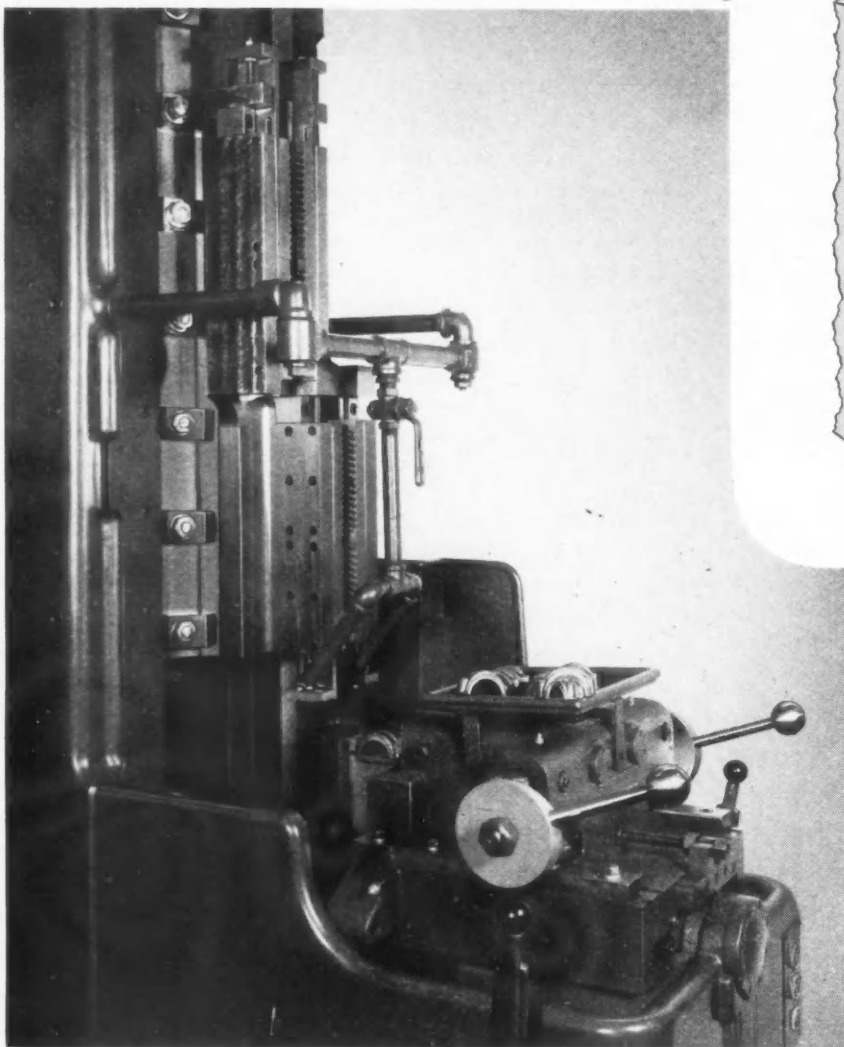
41 New Product Items

And Other High Spots, Such As:

Special wind tunnels for testing aluminum oil coolers; new applications for rigidizing; Caterpillar Tractor's unique method of plant expansion; significant automobile facts and figures for '48; Fiat's improved "500"; 1948-49 German passenger car specifications; and a listing of exhibitors at the National Instrument Conference.

*News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3*

How to make a SINGLE RAM HYDRO-BROACH produce like a DUPLEX MACHINE



Simplified sketch of setup illustrated in photograph at left.

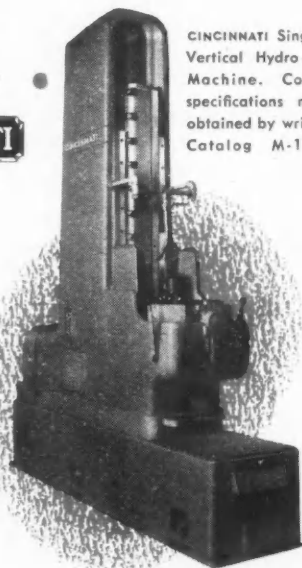
Part name Connecting rod cap
Material Steel forging
Operation Broach crank cheek faces
Stock removal $\frac{3}{32}$ " max.
Production 367 per hour
Equipment CINCINNATI No. 5-42
Single Ram Vertical Hydro-Broach
tooled up by Cincinnati Application
Engineers

Basically, duplex broaching machines have a big production advantage over single ram machines. In one complete cycle, they can broach twice as many parts. Nevertheless some types of work may be assigned to single ram machines, and with proper tooling, production will approach that of a duplex machine. In most cases, unit cost will be lower. In the illustration above, Cincinnati Application Engineers show you this can be done. ¶ Two connecting rod caps are clamped abreast in a manually operated fixture mounted on a CINCINNATI

No. 5-42 Single Ram Vertical Hydro-Broach. To minimize power requirements, the broaching cutters are in two sections, one offset and following the other (see drawing). In one cycle of the ram, two parts are broached, one at a time; over 360 caps per hour. ¶ CINCINNATI Hydro-Broach Machines and Application Engineering are at your service in devising new and lower cost methods. When writing, you will save time by including complete details with blueprints of the parts.



CINCINNATI Single Ram Vertical Hydro-Broach Machine. Complete specifications may be obtained by writing for Catalog M-1389-2.



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NEWS *of the*

AUTOMOTIVE INDUSTRIES

Vol. 99, No. 5

September 1, 1948

1949 Kaiser to Bow in September

The Kaiser-Frazer Corp. for the first time will introduce its new Kaiser and Frazer models separately. The 1949 Kaiser will be presented first, probably about Sept. 10, With the Frazer to follow some time later. While the car will not be radically changed, it will be improved stylewise by alterations in exterior trim. Several mechanical changes will also be introduced, and it is understood that one of the changes will be dual manifold-ing.

Chrysler Corp. Boosts Car Prices

The Chrysler Corp. is the second of the Big Three to effect two price increases within a period of two months. The company in mid-August announced a second price increase ranging from slightly more than two per cent to about 5.5 per cent, with the average slightly under five per cent. Dollar increases ranged from \$58 to \$98. Previously, prices had been raised about six per cent in June.

Kaiser-Frazer Gets Surplus Pig Iron Plant

The Kaiser-Frazer Corporation has taken over a government-owned coke and pig iron plant in Cleveland under a lease arrangement. Under its 30-day interim agreement with the government, Kaiser-Frazer will pay \$1.50 a ton for pig iron and coke produced pending the completion of a purchase or of a long term lease agreement. The plant, which has a capacity of 450,000 tons of pig iron and 382,000 tons of coke annually, had been sought by Tucker Corp.

Federal Reserve to Limit Car Time Sales

The Federal Reserve Board is getting ready to clamp down on installment credit. The FRB says that it will revive Regulation W in a slightly altered form on Sept. 20, 1948. Among other things, the regulation will prescribe credit limitations on the sale of new and used automobiles. All installment purchases of more than \$50 and less than \$5000 will be affected

by the issuance of the new regulation, and in the case of automobiles, the FRB will require down payments of one-third of the appraisal value of the vehicle. Automobile purchasers who buy at prices higher than those set forth in the standard appraisal guides will be forced to put up not only one-third of the appraisal value in cash, but also the difference between the appraisal value and the premium price. In addition, purchasers must pay off within 15 months any commodity valued at less than \$1000. In the case of goods selling at more than \$1000 but less than \$5000, purchasers are given 18 months to pay, except that monthly payments on amounts over \$1000 must not be less than \$70.

Car Makers Only Dent Huge Order Backlog

The automobile industry will go into 1949 with more than 4.5 million unfilled automobile orders on its books, according to George T. Christopher, president, Packard Motor Car Co. He said that despite excellent production so far this year, and good prospects for continuing at the same rate, the industry will only be able to reduce its backlog of unfilled or-

ders by 1.5 million units this year, from the six million car backlog at the beginning of 1948. He discounted the effect of the ERP and the defense program as significant factors in the current steel shortage, saying that European shipments are taking only about two per cent of total steel production.

Ford Foundry Supplying Lincoln Engine Blocks

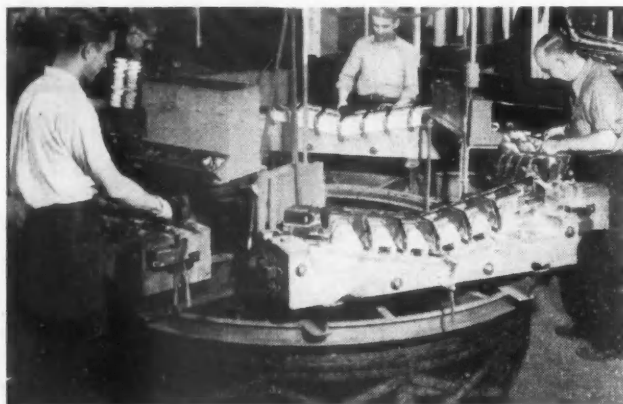
As a result of the Campbell, Wyant & Cannon strike, the Ford production foundry has started the manufacture of cylinder blocks for the Lincoln car and the extra heavy duty Ford truck. The supply of blocks was cut off by the CWC strike and production lines were forced to suspend operations. The Ford foundry has also undertaken the manufacture of camshafts for the Lincoln engine, for the six-cylinder engine, and for the tractor engine. It is understood that the cylinder block and camshaft jobs are to become a permanent part of the Ford production, and will not be suspended if the CWC strike is settled. It is expected that the cylinder block production will account for about half of Ford's needs for the Lincoln and Ford truck.

MINING MONSTER

Mounted on a Mack chassis, this special 19.5-yd rock body built by the Heil Co., Milwaukee, Wisc., is 138 in. high and 102 in. wide. The body is activated by a double action Heil hydraulic hoist with twin 10 in. cyl and a 40 in. stroke. This unit is to be used for mining operations.



NEWS of the AUTOMOTIVE INDUSTRIES



CADILLAC CAROUSEL
Cadillac radiator grilles are assembled on this interesting merry-go-round fixture. Developed by motion study, the fixture is served by bins for small parts and fastenings conveniently located within reach of each operator. As grilles are assembled, they are delivered directly to the assembly line.

GM, Ford & Chrysler Up Canadian Prices

Rising costs have forced the Ford Motor Co. of Canada to increase prices on cars and trucks by \$110 to \$210. A short time prior to the increase, the company had reduced prices by \$177 to \$363, following the reduction of the Canadian excise tax on automobiles to the old level of 10 per cent. Although the most recent increase amounts to less than the previous price reduction, most Ford models in Canada now cost the purchaser more than \$2000. The Chrysler Corp. has increased the prices of its entire line of passenger cars and trucks sold in Canada by eight per cent. The increase was attributed to rising costs of material and labor. GM has also raised the prices of its Canadian-made automobiles about eight per cent, effective August 10th.

British Austin Buys Canadian Plant

The Austin Motor Co., Ltd., British automobile manufacturer, has completed arrangements to purchase a plant in Hamilton, Ont., Canada, where cars will be produced for the Canadian market. Ontario Premier Drew noted that Austin is the first British automobile company to decide to make cars there. Production of trucks and cars for the Western Hemisphere and the Orient, as well as for Canada, will be undertaken within three months, it is said, and it is estimated the plant will employ between 800 and 1000 workers, with the initial production schedule calling for 200 to 500 cars a week.

Rubber Use 50% Above Best Prewar Years

Rubber consumption for American industry is today about half again as great as it was in prewar years, according to John L. Collyer, president, B. F. Goodrich Co. He points

out that consumption in the three years since V-J Day in 1945 was 55 per cent greater than the total of the three peak postwar years added together. In the last 36 months, American industry used 3,135,872 long tons of rubber compared with 2,025,819 tons in 1939-40-41, the previous peak years. A major factor in the increased use of rubber is the larger number of truck and bus tires used. The average production of truck and bus tires in the last three years has been just under 16 million units annually, compared to about nine million in the last three prewar years. In 1948, production of farm service tires is estimated at 5.2 million, nearly 3.5 times the average annual production for 1939-40-41.

Army Ordnance Asks Bids on Jeeps & 3/4-ton Trucks

Military truck orders in the industry have moved a step nearer to actuality. The Army Ordnance Dept. has requested bids for vehicles totaling \$21,768,000. Included are about 5000 jeeps, \$12,612,000; about 2000 3/4-ton four-wheel drives, \$9.1 million; and 15 ambulances, \$56,000. It is believed in the industry that Willys and Dodge will probably get the jeep and 3/4-ton business.

Ford and Union Agree On Insurance Program

The Ford Motor Car and the UAW-CIO have agreed on the details of a new insurance program for all hourly-rated employees. Under the new plan death benefits will be about double those provided under the original arrangement: equal to approximately one year's pay, with accidental death or dismemberment benefits amounting to about one and one half a full year's pay. Sickness and accident payments are increased from a flat \$15 a week under the old plan to from \$18 to \$36 weekly for 26 weeks, depending upon the employee's hourly

rate. Hospitalization and surgery benefits provided under the old plan are eliminated, but employees will have an opportunity to subscribe to group hospitalization and surgery benefit plans. Contributions of employees will range from \$2.07 to \$3.44 a month, compared with \$2.90 monthly under the old plan.

Packard Imports Pig Iron from Belgium & Austria

The Packard Motor Car Co. has confirmed that it is importing pig iron from Belgium and Austria. The company would not comment on the cost of bringing the material from Europe.

Oldsmobile Makes Progress with New Engine Tooling

Tooling is progressing rapidly on the new Oldsmobile V-Eight, valve-in-head engine, and actual production is expected to start soon. The engine is initially a high compression type, and is reported to have a compression ratio of approximately 8.0 to 1. Whether or not Oldsmobile will use the new V-Eight through its entire line is still very much a secret, but one unconfirmed report says that the six will be dropped from the line. Cadillac also has a new engine which is said to be similarly a valve-in-head V-Eight with a stepped-up compression ratio. Cadillac will be the first of the GM divisions to announce new models, according to current reports.

Salt Chromate Solution Cuts Car Corrosion

As a result of tests conducted by the Goodyear Tire & Rubber Co., the use of a new salt-sodium dichromate solution for snow and ice removal on city streets is expected to see increased use by municipalities next winter. A report on the tests conducted in Akron, O. last winter indicated that 68 per cent of all cars used in the experiments showed no corrosion at all on under-body metal parts. Ninety-six per cent of the new cars which had been driven only one winter on streets treated with the salt-sodium dichromate solution, and never in the 100 per cent salt solution normally used, showed no corrosion and four per cent showed only traces of corrosive effects. Tests also show, according to company engineers, that even on older cars chromates will arrest "trapped" salt corrosion in body and fender joints that continues through the summer every time the car becomes wet. The tests have also shown that the salt chromate solution is not only harmless to natural and synthetic rubber, but that it actually tends to toughen it slightly.

NEWS *of the* AUTOMOTIVE INDUSTRIES

Frederic Flader Develops Baby Turbo-Jet

Small enough for civilian use, and said to be powerful enough to fly a four or five place personal plane at 250 mph, a new turbo-jet engine, designated the XJ-55-FF-1 is now being produced by Frederic Flader, Inc., North Tonawanda, N. Y. for the U.S. Air Force.

Haulaway Firm Adopts Five Car Trailer Unit

The Kenosha Auto Transport Co., haulaway supplier for Nash, has put in operation a new type haulaway trailer that carries five new cars instead of four. One of the cars is carried forward over the cab, and the trailer is said to have a novel linkage arrangement. Overall length of the unit is 45 ft, legal in all states except Indiana. It is built by the La Crosse Tractor Corp. under patents owned by the haulaway firm.

Ford Building Hill for Test Purposes

The Ford Motor Co. is building an artificial hill at its Dearborn test track. The incline has been designed primarily to test transmissions and the hill climbing ability of cars and trucks, and when completed it will be 45 ft high and will have two inclines with grades of 17 per cent and 30 per cent. It is being constructed of about 112,000 tons of steel slag, and will be capped with a 24 ft ribbon of reinforced concrete protected by six ft guard rails.

Cadillac Shipping Parts for Repair by Air

GM's Cadillac Motor Car Div. is averaging about 12 tons of air freight shipments of replacement parts monthly. George W. Otto, Cadillac parts and service manager, says that the program is very successful in reducing warehousing costs and delivery time, and that breakage and damage to air freight shipments are lower than with other forms of delivery.

Army Seeks Higher Voltage On Military Trucks

High voltage electrical systems for trucks may result from developments along that line now being sought by the armed forces. Army Ordnance wants all vehicles equipped with a 24-volt system for easier starting in cold climates, and also to accommodate such heavy current items as radio equipment and heated garments for crews. The Army Ordnance department is understood to be working with suppliers, and is said to

have assured truck builders that when contracts are let for the vehicles, a satisfactory high voltage system will be available and production facilities adequate to supply them.

Study Committee to Support Federal Transport Dept.

The idea of a Federal transportation department, headed by an appointee with Cabinet rank, to encompass all fields of transport, is not dead. The latest thinking is that the Brookings Institution, which is investigating transportation agencies in the government, and the Hoover commission, to which it reports, will recommend that such a department be established. Also, it is reported that Thomas E. Dewey will press for the change if elected President this fall.

Ford Promotes Snyder to Styling Director

The Ford Motor Co. has promoted George Snyder to director of styling from his former position of assistant director of styling in charge of design activities. He was formerly chief designer of advanced styling for GM.

Truck Body Builders to Ask For More Steel

The newly formed National Truck Body Builders Association is surveying the needs of all truck body builders for steel. It will then make a request for an allotment to the ODT,

which in turn will pass on the request, with its recommendation, to the Commerce Dept. The Truck Trailer Manufacturers Association has already made such a request for the 200,000 tons of steel that it estimates its branch of the industry will require annually.

Crosley Doubling Size of Engine Plant

Doubling present production capacity, a 45,000-sq ft addition being built by Crosley Motors to its plant in Cincinnati, O., will permit the output of 500 Cobra engines a day. The new plant's upper floor will house engine assembly and final testing.

Dedicate L-M Plant in St. Louis, Sept. 21

In operation since March 15, Ford Motor Co.'s Lincoln-Mercury assembly plant in St. Louis will be dedicated on Sept. 21. Benson Ford, director of the Lincoln-Mercury Div. will be the principal speaker.

Union Activities Ban on Foremen Confirmed

In a significant ruling the Sixth Circuit Court of Appeals in Cincinnati has reversed an NLRB order and has upheld the right of an employer to interfere with supervisory employees who engage in union activities. The court set aside an NLRB order against the Budd Co. of Detroit.



FORD SKYLIFTING

Huge rolls of steel at the Rouge plant of the Ford Motor Co. are being handled by the Skylift Giant shown above. Capable of handling loads up to 20,000 lb, the Giant has taken over duties which were formerly performed by cranes in the press steel building.

NEWS of the AUTOMOTIVE INDUSTRIES

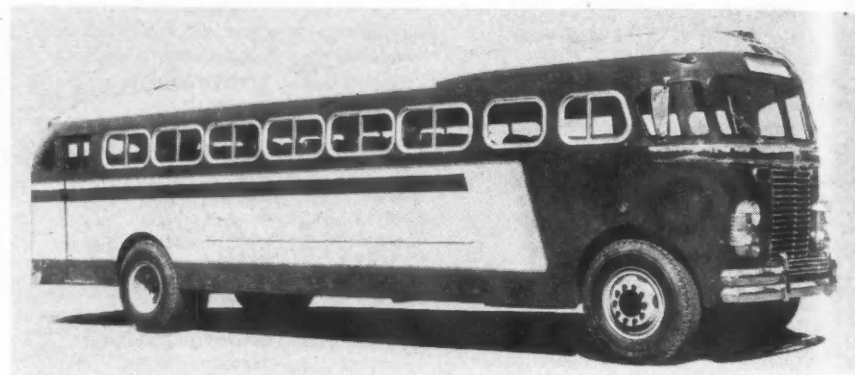
Market Broadened for English Fords

The enthusiasm with which the Anglia and Prefect passenger cars, and Thames panel trucks, all made by the Ford Motor Co., Ltd., in England, have been received in the U. S. has resulted in the expansion of Ford's domestic foreign sales program to include the South and West Coast regions. This was announced recently by J. R. Davis, Ford vice-president and director of sales and advertising, who stated that the first shipments of the English Ford units had arrived in Southern and Western ports, and that 12 direct dealers and 200 associate dealers had been appointed in these sections. Mr. Davis emphasized that shipments of these cars and trucks would continue to arrive each month on an accelerated basis. The Dagenham plant in England can produce up to 4000 vehicles a month for the American market.

A total of 3000 of these units have been received, and orders for an additional 6000 have been placed with the company, since shipments were started in May. Regular consignments of parts are being received enabling dealers handling the line to offer prompt and complete service, and service and parts schools for dealer personnel are being conducted.

AMA's Facts and Figures Ready For Publication

The 1948 edition of *Automobile Facts and Figures* published by the AMA is said to include some interesting new data not contained in last



SOUTH OF THE BORDER

Developed specifically for the Mexican market, the new Super-Power Duraliner, with rear exit door, is a product of the Fitzjohn Coach Co., Muskegon, Mich. With reclining seats, the bus can carry 36 passengers. With stationary headrest seats, it can transport 41 passengers.

year's edition. Its companion piece, *Motor Truck Facts*, is published every two years and will be out in the spring of 1949, according to present plans.

Rubber Stockpiling Lags Behind Prewar

Stockpiling of rubber is behind schedule, according to estimates in the tire industry. It is estimated that stock on hand at present totals only about 40 per cent of the reserve this country had on hand at the time of Pearl Harbor. Congressional appropriations, availability of materials, and market prices are all affecting the speed with which reserves can be built up.

Studebaker Plans Expansion in California

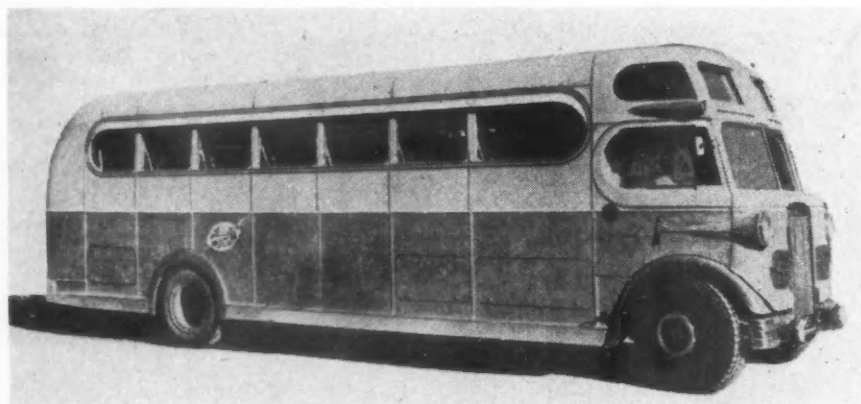
Plans for the erection in California of a new body fabricating plant, an additional truck assembly factory, and a parts depot and distributing center have been revealed by C. E. Whittaker, president of the Studebaker Pacific Corp. The locations have not as yet been decided upon. Production at the Los Angeles assembly plant is expected to reach 25,000 cars in 1948. The newly announced construction, when completed, is expected to bring total production of Studebaker cars and trucks in California to about 50,000 units a year.

Westinghouse Reactivates Jet Engine Plant

Under a joint plan between the Westinghouse Electric Corp. and the Navy, the company will reactivate and operate the Naval Industrial Reserve plant at Kansas City, Mo. The plant will be used for the production of axial-flow jet aircraft engines.

No ERP Aid for French Automobile Industry

In all probability the French automobile industry will not ask for assistance under the European Recovery Program. The question has been brought before the French Road Transport Commission, which has decided that the national industry is able to meet all requirements as far as road transportation is concerned, and that consequently there is no need to ask for assistance from the United States.



SOUTH AFRICAN LANDLINER

Now in use in South Africa, Leyland Motors luxury coach, the Astraline Landliner, is powered by a 125-hp Diesel engine. This bus is 10.5 ft high, and has a 19 ft wheelbase. This British bus incorporates the latest adjustable reclining seats, a pantry, and radio and intercommunication system.

NEWS of the AUTOMOTIVE INDUSTRIES

Hercules Body Co. Closing Down

The Hercules Body Co., established in 1902 at Evansville, Ind., is officially winding up its business. During World War II, the plant produced 50,000 truck bodies for the armed forces, and the company has supplied station wagon and truck bodies to other manufacturers. According to George K. Specht, president, the firm is winding up its business "because transportation of the finished product to the market is prohibitive in this competitive business. It is impossible for Hercules to continue its present business and furnish a product for factories 500 miles from Evansville in competition with factories nearer the market."

Dutch Government Working on Rubber for Pavement

Although rubber has always been considered too costly as paving material, the Dutch government is conducting extensive experiments with rubber topping for highways. Tests are being carried on in a government laboratory at Delft, Holland.

Auto-Lite Buys Wright Plant at Lockland, O., From WAA

The former Wright Aeronautical Plant at Lockland, O. has been purchased from the War Assets Administration by the Electric Auto-Lite Co. of Toledo, O. Acquiring title to about 4.5 million sq ft of floor area, Auto-Lite took immediate possession of the huge plant. A lease covering the North Shop of the plant is being made with the General Electric Co. for the production of jet propulsion engines under the Government's Defense Program, permitting the use by Auto-Lite of about 3.5 million sq ft for manufacturing purposes.

\$750,000 to Equip Calif. Plant for 1949 Ford

More than three-quarters of a million dollars have been spent by the Ford Motor Co. to equip its Long Beach, Calif., assembly plant for the production of the 1949 Ford, according to Aubrey Edwards, plant manager.

Fiat & Lancia Discuss Merger With GM

Representatives of the Fiat and Lancia companies have left Italy to discuss an amalgamation with General Motors. This move was suggested by Signor Caspari, president

of the Italian Council, and it is understood that a commercial and financial union is to be considered, together with the supply of the raw materials needed by the Italian industry.

Iron and Steel Exports Higher in Third Qtr.

The Commerce Dept. has set export quotas on iron and steel products for the third quarter of this year at 1,120,000 tons. The figure represents an increase of 67,000 tons over the second quarter quota.

Davis & Kline Now Governors of Highway Users

Allan B. Kline, president, American Farm Bureau Federation, and J. R. Davis, vice president, Ford Motor Co. have accepted memberships on the Board of Governors of the National Highway Users Conference, Chairman Albert Bradley, GM executive vice president, has announced.

Form Stanley Aviation, Buffalo, N.Y.

Robert M. Stanley, former vice-president in charge of engineering for the Bell Aircraft Corp. has announced that he has formed his own aviation engineering company in Buffalo, N. Y. to be known as the Stanley Aviation Corp. "Our aims are to do work in general aircraft engineering design and in research, including guided missiles and allied subjects—all in the military field," Mr. Stanley declared. Mr. Stanley said that he has received a Navy contract "for a little less than \$100,000," involving the manufacture of electronic instruments.

Plymouth Plant to Build Station Wagon Bodies

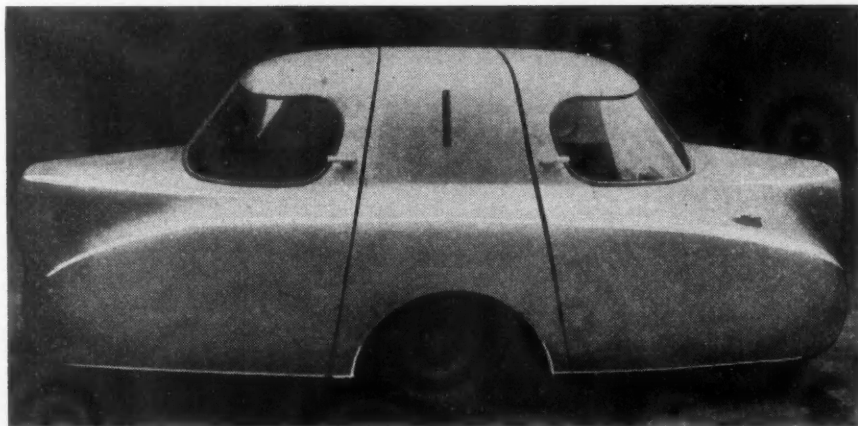
Station wagon bodies will be produced at the Evansville, Ind. assembly plant of Chrysler's Plymouth Motor Corp. Production is scheduled to start in October if necessary equipment and materials can be assembled by that time, officials said. Employment is expected to reach 400, and it is expected that many of the employees of the Hercules Body Co., which ceased operations recently, will probably be employed in the new plant.

North American Surveys Need for Giant Metal Stretchers

Although North American Aviation is now using the largest metal stretching machines in existence, future forming operations may require metal stretchers with from five to ten times their capacity. Since such machines would dwarf those now in use, and in anticipation of metal forming problems which will come with aircraft designs now "on the boards," North American has, under an Air Force contract, begun to canvass the industry to determine the need for these larger machines.

GM Operating New Foundry in Defiance, O.

Operations commenced recently at the new GM foundry at Defiance, O., with the employment of about 1200 employees planned by the end of this year. Although the foundry is not fully completed, employee training will be started at once. The first product of the huge multi-million dollar plant will be castings for Diesel and automobile engines.



UNCONVENTIONAL RUNABOUT

This new French two-passenger runabout features two driving wheels at the center, a steering wheel at the front, and an idler wheel at the rear. Powered by a centrally located standard Fiat 500 engine, it has an empty weight of 1000 lb; overall length, 135 in.; width, 63 in.; and wheelbase, 95 in. An average speed of 40 mph is reported.

NEWS of the AUTOMOTIVE INDUSTRIES

NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the Six Months' 1948 Totals.

Make	June 1948	May 1948	June 1947	Six Months		Per Cent of Total	
				Units	1947	1948	1947
Chevrolet	57,567	53,896	59,661	357,613	316,286	21.42	20.61
Ford	16,527	6,056	44,735	176,398	255,640	10.57	16.65
Plymouth	14,941	25,908	25,658	157,555	156,233	9.44	10.18
Buick	19,961	19,043	20,352	126,627	114,844	7.58	7.48
Pontiac	17,430	17,861	18,201	117,524	102,154	7.04	6.66
Dodge	9,280	17,141	16,867	104,167	98,430	6.24	6.41
Oldsmobile	14,587	14,711	14,897	91,504	90,079	5.48	5.87
Studebaker	13,267	12,121	8,658	72,935	50,985	4.37	3.32
Nash	10,573	11,207	8,505	61,619	54,707	3.69	3.56
Hudson	11,686	10,784	8,670	59,008	50,058	3.53	3.26
Kaiser	11,239	10,822	3,337	55,919	18,613	3.35	1.21
Mercury	11,053	8,257	8,454	51,105	54,362	3.06	3.54
Chrysler	4,783	9,377	7,419	50,478	44,918	3.02	2.93
DeSoto	3,877	7,011	5,549	39,089	34,389	2.34	2.24
Packard	8,007	8,464	3,526	38,159	21,203	2.29	1.38
Frazier	7,004	7,216	5,003	36,292	15,135	2.17	.99
Cadillac	5,373	5,763	4,665	27,387	25,506	1.64	1.66
Willys	1,541	2,485	2,049	13,721	11,380	.82	.74
Crosley	2,734	2,944	1,319	13,481	7,428	.81	.48
Lincoln	3,723	2,967	2,272	12,020	12,257	.72	.80
Austin	925	953	.....	4,501	.....	.27	.....
British Ford	199	100	.....	300	.....	.02	.....
Playboy	9	5	.....	22	.....	.....	.....
Tucker	.....	1	.....	1	.....	.....	.....
All Others	640	545	66	2,103	391	.13	.03
Totals	246,926	255,638	269,863	1,669,528	1,534,918	100.00	100.00

* Data from R. L. Polk & Co. are complete for all states and for all months.

Goodrich Uses Radioactive Tracers in Tire Study

A further indication that atomic energy is becoming of increasing importance in industry is seen in a recent announcement by the B. F. Goodrich Co. that among the experiments now being conducted in the company's new research center near Brecksville, O. is one in which radioactive tracers are added to a chemical solution through which tire cords are passed. Radiographs reveal the amount of penetration, whether it is uniform and other characteristics of the solution on various types and grades of cord.

Auto-Lite Battery Building Clearwater, Calif. Plant

The Auto-Lite Battery Corp. has begun work on its new million dol-

lar battery manufacturing plant at Clearwater, Calif. About 14 miles from downtown Los Angeles, the 90,000 sq ft building will be completely streamlined to facilitate loading and unloading along the entire length of the 530 ft building. Production will be 3000 batteries daily, and the completion date has been set for December 31.

New IHC Parts Depot in St. Paul, Minn.

The International Harvester Co. is now building a new wholesale distributing service parts depot in St. Paul, Minn., adjoining the present Harvester building there. To cost over a million dollars, the new depot is the third of Harvester's network of 11 to be installed throughout the U. S. It will serve as a wholesale parts distribution center for company-

owned branches and retail dealers in Minnesota, North and South Dakota, northwestern Wisconsin and northern Iowa. It will be of one-story construction and will contain a total area of about 250,000 sq ft.

Cornell to Test Aviation Hydraulic Fluids

The Aeronautical Laboratory of Cornell University has been designated by the aircraft manufacturing industry as its representative to conduct evaluation tests on non-flammable hydraulic fluids for civil aircraft. Oliver P. Echols, president, Aircraft Industries Association, announced the program and said that it climaxed an intensive cooperative program to stimulate the development of such fluids and thus contribute to a major improvement in flying safety.

Employ the Handicapped Week in October

To be proclaimed by the President, the first week in October will be designated as National Employ The Physically Handicapped Week. The purpose of this special emphasis is to make the nation conscious of the employment qualifications of those with physical impairments, to enlist the cooperation and consideration of employers in hiring these workers, and to inform the physically handicapped of the placement, training and counselling facilities available to them throughout the country. In every community the U. S. Employment Service spearheads the action during this week, organizing committees made up of interested government and social agencies, training institutions, and civic groups. Widespread publicity programs are undertaken and concentrated campaigns are launched to place more and more of physically handicapped workers in suitable jobs. Every year the effect of this emphasis is felt. During National Employ the Physically



TAIL TEST TOW

Driven a total of 724 mi over back country roads by a Convair engineer, this truck towed the redesigned tail wheel installation for the L-13 liaison plane for the equivalent of 1400 take-offs and landings. The new design includes a pre-loaded, compensated, hydraulic cylinder which prevents tail wheel shimmy.

NEWS of the AUTOMOTIVE INDUSTRIES



APPROVED AERONCA

Float plane approval for the 1948 Aeronca Sedan has been given by the CAA. The four place Aeronca Sedan is equipped with model 2000 Edo floats, and is powered by a 145-hp Continental engine. With a gross weight of 2100 lb, it has a cruising speed of 105 mph.

Handicapped Week and, in fact, during the entire month, more of these workers obtain jobs.

However, obviously this program is not one which should be given attention for a day, week or month. It is a long-range and continuing program. Employers and the community should be constantly alerted to the problem of employment for the physically handicapped. It has been proven that these workers are not only satisfactory, but in many cases are superior to those with no physical impairments. In addition, the community benefits by having these individuals gainfully employed.

Ryan Gets \$2.5 Million USAF Contract

The Ryan Aeronautical Co. has signed a \$2.5 million contract with the U. S. Air Force for 158 Navion four-place planes and components and spares, which in dollar value are equivalent to about another 60 complete Ryan Navions.

GM Builds New Plant for Detroit Transmission

Automatic transmissions continue to bob up in the automotive news. GM has disclosed that its Detroit Transmission Div. will build a new plant in Detroit. Containing about a quarter of a million square feet of floor space, it will function for the present as a feeder for the main plant. Producer of the Hydra-Matic transmission, Detroit Transmission, has been making them at a rate of 2000 a day.

Gulf Service Station for Private Planes

Perhaps portending a trend, plans for a super service station for pri-

vate planes have been announced by the Gulf Oil Corp. A proposal to erect such a station at the Allegheny County Municipal Airport, near Pittsburgh, has been approved in principle by the County Commissioners. The proposed building, which will cost about \$25,000 to \$30,000 will be about 70 by 30 ft.

Buick Producing 400 Dynaflows a Day

Pointing out that current production of Dynaflow transmissions is over 400 units a day, Harlow H. Cur-tice, GM vice president and Buick general manager, stated that Dynaf-low transmissions will be available 100 per cent on all Buick Roadmaster

cars produced this month. Through July 30, of the 159,680 Buicks produced in 1948, 23,136 were Road-master models equipped with Dyna-flow.

British Approved Ghost Jet for Airliners

The British de Havilland Ghost jet engine, which has just passed the British Air Registration Board 150-hr Type Test, is the first straight jet to be fully approved for civil passenger transport operation under the ARB regulations. The British D.H. 106 Comet airliner is to be equipped with four Ghost jet engines.

Bendix Buys Two Surplus Aircraft Parts Plants

The Bendix Aviation Corp. has bought two adjoining government-owned surplus aircraft parts plants at South Bend, Ind., from the War Assets Administration for \$1,050,000.

Goodrich Constructing New Akron Plant

Representing the first major expansion of production facilities in Akron, O., by the B. F. Goodrich Co. in many years, a new multi-million dollar plant for the manufacture of industrial rubber belting is now being constructed. The new plant will contain 150,000 sq ft of floor space.

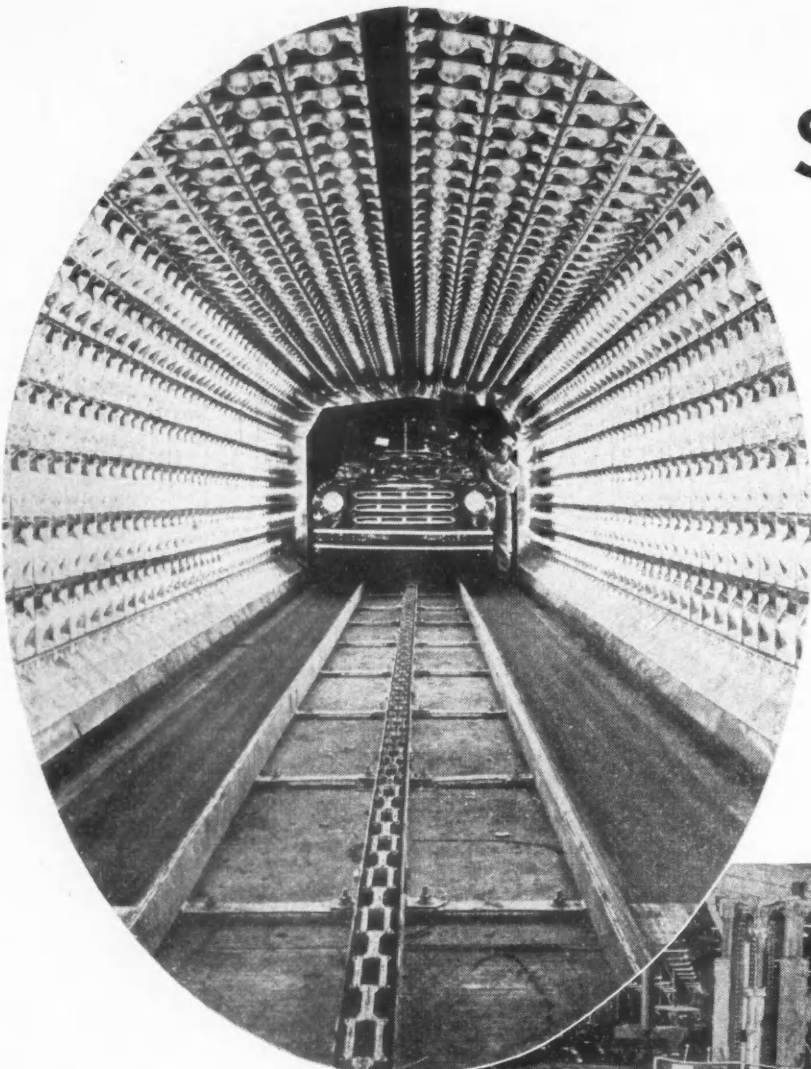
(Turn to page 90, please)

NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the Six Months' 1948 Totals.

Make	June 1948	May 1948	June 1947	Six Months		Per Cent of Total	1947
				1948	1947		
Chevrolet	26,175	28,276	9,206	154,493	104,814	28.89	24.20
Ford	21,695	26,034	17,485	118,877	102,842	22.23	23.75
International	11,636	12,106	8,929	70,266	54,213	13.14	12.52
Dodge	6,856	11,110	10,709	58,186	64,584	10.88	14.91
G.M.C.	5,608	5,916	4,924	34,522	27,500	6.46	6.35
Willys-Jeep	4,066	4,785	4,642	25,248	20,657	4.72	4.77
Studebaker	2,987	3,120	3,415	23,534	20,478	4.40	4.73
Willys-Truck	2,841	2,840	.....	12,918	.....	2.42	.....
White	1,018	1,111	981	6,389	6,518	1.19	1.51
Reo	954	1,135	1,121	6,285	7,212	1.18	1.67
Diamond T	858	1,028	811	5,573	5,027	1.04	1.16
Mack	814	963	848	5,526	4,798	1.03	1.11
Divco	527	635	433	3,243	2,354	.61	.54
Federal	324	468	475	2,606	2,752	.49	.64
Brockway	200	235	282	1,680	2,146	.31	.50
Autocar	185	243	342	1,457	2,416	.27	.56
Crosley	230	295	.....	1,418	.....	.27	.....
F.W.D.	53	39	104	406	638	.08	.15
Sterling	26	36	49	246	288	.05	.06
Ward LaFrance	17	33	40	209	289	.04	.06
Kenworth	27	55	.....	205	.....	.04	.....
Oshkosh	15	7	16	129	120	.02	.03
Hudson	2	11	304	110	1,817	.02	.42
Nash	4	1	.....	13	.....	.....	.....
All Others	206	132	342	1,185	1,617	.22	.36
Total	87,324	100,614	65,458	534,724	433,080	100.00	100.00

* Data from R. L. Polk & Co. are complete for all states and for all months.

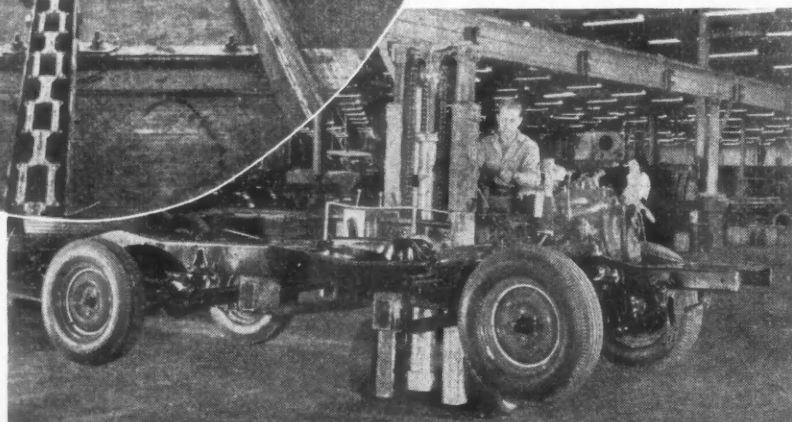


Studebaker "Forty-Niners" nearing the end of the final assembly line.

Studebaker's

By Joseph Geschelin

STUDEBAKER "Forty-Niners", the new 1949 line of motor trucks recently announced — handsomely styled and finished in lustrous bright hues of durable synthetic enamel — are pouring in a steady stream from the new home recently acquired by the Studebaker Corp. The last time this writer visited the plant it was hailed as one of the largest units of the war-time airplane engine program, pro-



As the chassis reaches the end of the chassis assembly line it is picked up by a fork truck, as shown, and delivered to the final assembly line.



'49 Trucks Built in Ultra-Modern Plant

ducing Studebaker-built Wright Cyclone engines.

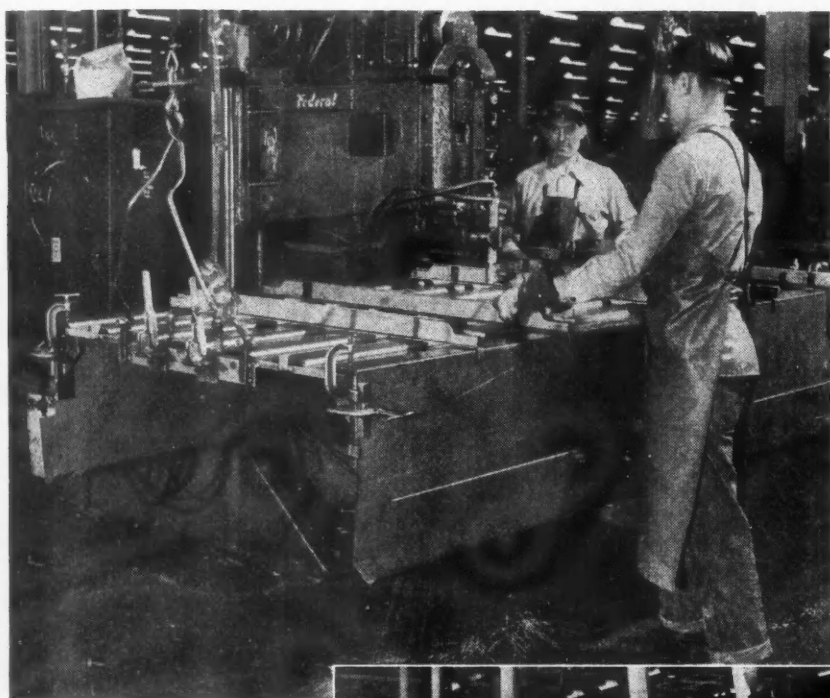
The building, one of the most modern to be found in this country, was erected during the war (see *AUTOMOTIVE INDUSTRIES*, April 1, 1943) and includes such advanced features as windowless construction and full air-conditioning throughout. Apart from excellent lighting and comfortable working conditions the major value of the plant for truck assembly is its spaciousness. With a floor space of around one million sq ft, it offers ample room for assembly lines, fabrication areas, and for the essential requirements of testing and reconditioning in the interest of con-

sumer acceptance. In fact the element of ample working space has proved to be one of the most valuable assets of Studebaker's truck establishment.

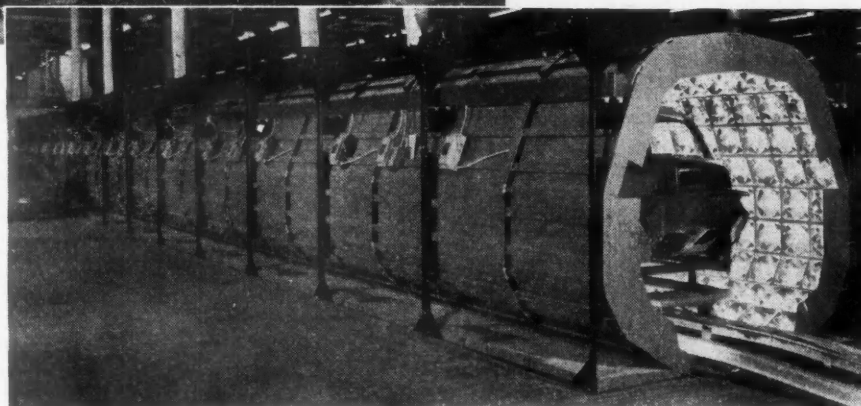
Manufacturing operations in the new plant include assembly of chassis, cabs and pick-up bodies as well as the painting of cabs, bodies and wheels. Here vehicles are also given their final tuning and testing and made ready for shipment and delivery. Engines are delivered from Studebaker's engine plant a short distance to the north for installation near the end of the chassis line.

Initial chassis assembly starts on a side-bar conveyor about 560 ft in length. As a chassis comes off the line it is lowered onto the floor, picked up by a heavy duty fork truck, raised and turned in the large open bay at the end of the line, and then moved over to the final assembly line a short distance away. The latter is of floor ribbon type about 325 feet long arranged for final assembly operations including installation of the body and front end sheet metal.

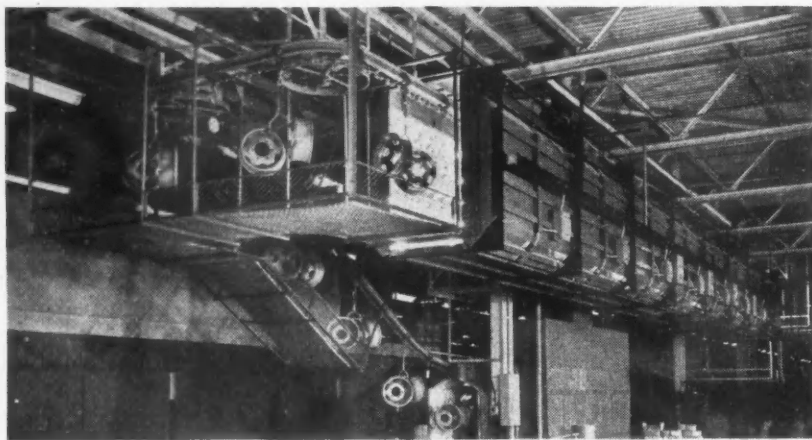
One corner of the plant has



A view at one of the welding stations on the pick-up body fabrication line. Here the operators are spot welding the reinforcing members to the floor in this Federal welding machine.



Perspective of the 95-ft Fostoria infra-red heating tunnel installed for the baking of finish on cabs and pick-up bodies.



Wheels and rims are dried in this overhead-mounted oven. Wire mesh guards are suspended under the conveyor to prevent injury to workers in case of falling parts.

been well organized for the assembly and painting of cabs and pick-up bodies. Stampings are received from the main plant and in the case of the cab are assembled on a merry-go-round framing and metal finish conveyor running some 460 ft in length. The cowl and floor section is first fitted onto a rigid steel dolly which serves as a framing jig for initial welding. Following this the roof and rear panel section is installed, using an overhead-mounted framing fixture to assure proper alignment.

The timing of the merry-go-round is such as to permit the completion of all welding operations, including those in the arc welding booth, on one leg of the conveyor. As the cabs leave the welding booth and enter the other side of the conveyor they are

travelling over the metal finish line.

In the same area are the facilities for cleaning and Bonderizing, paint spray and drying. An interesting feature of this department is the Fostoria infra-red, tunnel-type drying oven which is used for baking the synthetic enamel on cabs and pick-up bodies. This oven is about 95 ft in length, one of the largest installations of its kind.

Pick-up bodies are assembled from two major stampings and other parts on a welding line adjacent to cab framing. Here the work is done exclusively on a line of spot welding machines.

Another of the major assembly lines is the cab fit and trim conveyor running around 850 ft. Cabs are completely outfitted with hardware, instrument panel, wiring, etc., and trimmed ready for installation. As they come off this line, cabs are routed to a sub-assembly conveyor arranged in the form of an "L", meeting the trim line at one end and with the outer leg parallel to the final assembly line. The function of this line is to prepare a complete assembly of sheet metal, consisting of the trimmed cab, radiator, grille, front end sheet metal, front fenders, and hood. This is done by integrating the (*Turn to page 84, please*)

Senate Advisory Council to Make Survey of Pricing Policies

THE Capehart subcommittee investigating trade policies, including effects of f.o.b. pricing, has set Sept. 15 as the date for the first meeting in Washington of its recently appointed Advisory Council. Senator Capehart will then ask the Council—composed of representatives of industry, agriculture, labor and consumers—to make surveys of the impact of pricing policies and to report to his group not later than mid-November. At that time, the subcommittee staff expects to have completed its preliminary investigations and to be ready to call full-scale public hearings. Early hearings will be devoted largely to the pricing problem as a result of the cement case decision.

"This ruling prohibits absorption of freight costs by producers," Senator Capehart said. "While the decision applies only to cement, it can be applied to every industry in the United States which is affected by freight costs.

"The ultimate question to be decided," he added,

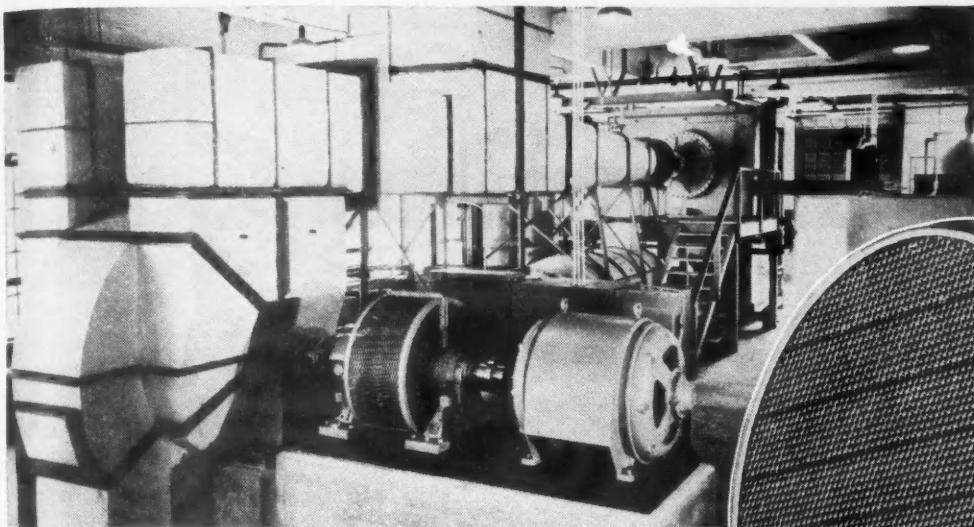
"is whether sellers should be permitted to: sell their products throughout the nation at a uniform delivered price, or, absorb freight or any part thereof in order to compete with competitors whose plants are located nearer the customer."

The Council will be requested to follow two lines in making its survey. One is to check and report on the effect of such pricing policies on the specific field represented. The other is to make the same check from a standpoint of the effect on the community (or customer).

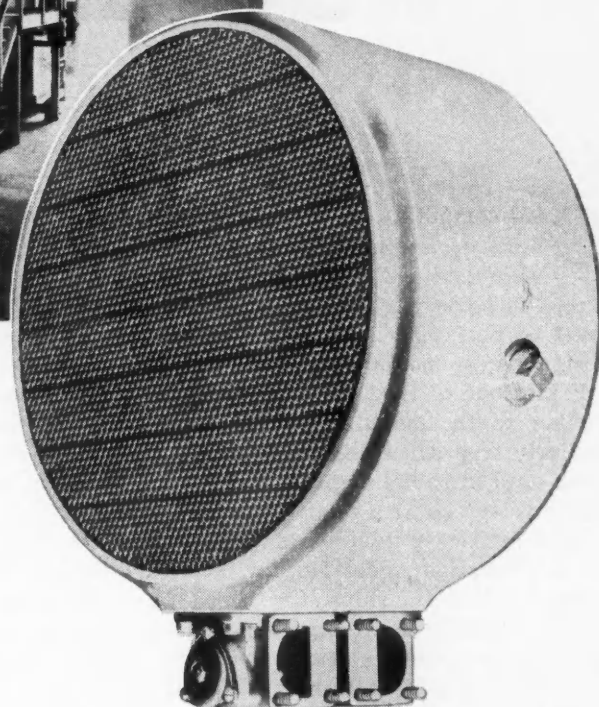
Roy C. Ingersoll, Ingersoll Steel and Disk Division of Borg-Warner Corp.; L. A. McQueen, General Tire & Rubber Co.; and James D. Mooney, Willys-Overland Co., are included among the Council members. Other members of the committee are:

James H. Ackerman, Lawrence Portland Cement Co.; John C. Bowen, Lehigh-Portland Cement Co.; James Brownlee, retired food processing executive; Edward W. Carter, Broadway Department Stores, Inc.; Walter L. Couse, Water. L. Couse & Co.; Cris Dobbins, Ideal Cement

(*Turn to page 72, please*)



(Upper left) Here is a 16-in. aluminum oil cooler, one of the types tested in the new wind tunnel.



(Inset) Hot wind tunnel which normally operates at 100 F inlet air temperature.

Special Wind Tunnels for Testing Aluminum Oil Coolers

TESTING of oil coolers for jet engines has been greatly facilitated by the two new wind tunnels at the Waltham, Mass., plant of the Standard-Thomson Corp. The research laboratory contains a hot run tunnel which normally operates at 100 F inlet air temperature, and a refrigerated tunnel designed to have capacity enough to supply twice rated air to a 24-in. diameter oil cooler at -60 F when rated oil at 225 F is flowing through the oil cooler. The hot run tunnel is equipped with a high-speed fan coupled directly to a Dynamatic Corp. magnetic clutch and driven by a 300-hp electric motor. Fan speed may be controlled over an infinite range of values by means of the magnetic clutch. The design capacity of the hot tunnel is 48,000 cfm at 70 F. The cold run tunnel has a similar but smaller fan and

magnetic clutch unit driven by a 200-hp motor. Its design capacity is 24,000 cfm at 70 F. Inlet air temperature in either tunnel can be controlled to within plus or minus one degree.

In making a test, the test specimen is inserted into the duct by means of special adapters. For hot tunnel runs the oil cooler is located outside the mixing chamber and the exit air exhausts directly into the mixing chamber, where it circulates past baffles and exits through a venturi tube at the top of the mixing chamber back into the tunnel. The cold run tests are set up in a similar fashion, except that the oil cooler is located inside the mixing chamber itself.

One of the principal uses for the wind tunnels is testing the new aluminum oil coolers made by the Clifford Manufacturing Division of the Standard-Thomson Corp. These weight-saving coolers are fabricated by brazing and welding. There are from 600 to 6000 aluminum tubes, with a wall thickness of 0.006 in. in each cooler. In addition to taking the heat from the oil in jet engines, the cooler pre-heats the fuel.

Radial Engine Cam

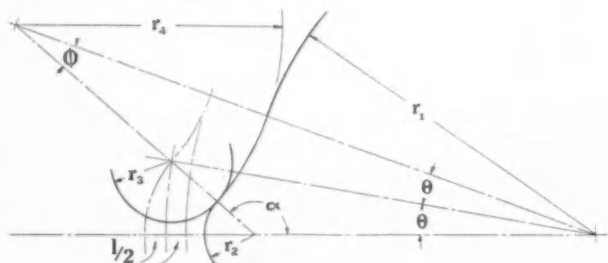
PART ONE

Relative Proportions of Lobe Height and the Four Radii of Multi-Lobed Ring Cams

CAM computations, whether mathematical, graphical, or a combination of the two, are always slow and tedious, and whenever a slight error creeps into the work it means that one or more steps must be repeated. Moreover, when aiming at certain design requirements, the procedure often resolves itself into one of trial and error, which obviously adds further to the magnitude of the task. This is particularly true when dealing with the multi-lobed ring cams used in radial engines, because the variable factors involved cover a relatively wide range.

This article in two parts presents the results of an investigation undertaken with a view toward establishing relationships for these variables which should simplify the designer's problems and reduce the number of calculations necessary. It is based upon what might be termed an ideal layout since it seeks to maintain for any set of conditions a minimum acceleration at the point where the latter changes from positive to negative and vice versa. It is applicable to any ring cam whose relative rotative speed, and the height and included angle of the lobe, are dictated within certain prescribed limits by the requirements of the engine.

The determination of cam lobe dimensions to conform with acceleration limitations will be given detailed consideration in Part II of this article to be published in an early issue of AUTOMOTIVE INDUSTRIES. Therefore for the present it shall be assumed that these dimensions have been chosen advisedly. It is apparent that to attain minimum acceleration at a certain speed with a lobe of any given height and included angle the follower should move a distance equal to one-half of its full travel during the period that the cam is moving one-half the angular distance between zero and maximum lift. The position of the cam follower at mean lift and angular travel is shown in Fig. 1.



It will be noted in this diagram that the center of the follower radius is at the intersection of a line at angle θ , which is one-half the angular travel between zero and full lift, and a line drawn between the centers of the nose and flank radii. This treatment is not to be concerned here with modified forms, such as those which may have a flat portion between the nose and flank, or for that matter with ramps placed outside the theoretical beginning or termination of follower movement. The latter are necessary quite often for the purpose of reducing velocity during the period of clearance take-up in the case of a solid follower, or slack take-up if the lifter is one of the hydraulic type.

Brief examination of the diagram discloses that for each cam angle θ and lift l , there must be some definite relationship between the four radii; namely, the base circle radius r_1 , the nose radius r_2 , the follower radius r_3 and the flank radius r_4 . Applying the law of sines,

$$\sin \phi = \frac{\sin \theta (r_1 + r_3 + l/2)}{(r_4 - r_3)} = \frac{\sin 2\theta (r_1 - r_2 + l)}{(r_2 + r_4)} \quad (1)$$

Solving, to get an expression in terms of cam angle,

$$\cos \theta = \frac{(r_1 + r_3 + l/2) (r_2 + r_4)}{2(r_4 - r_3) (r_1 - r_2 + l)} \quad (2)$$

Also, by similar procedure,

$$\sin \alpha = \frac{\sin \theta (r_1 + r_3 + l/2)}{(r_2 + r_3)} = \frac{\sin 2\theta (r_1 + r_4)}{(r_2 + r_4)} \quad (3)$$

and

$$\cos \theta = \frac{(r_1 + r_3 + l/2) (r_2 + r_4)}{2(r_2 + r_3) (r_1 + r_4)} \quad (4)$$

Thus, by equating the two expressions for $\cos \theta$ and reducing,

Fig. 1. Diagram showing position of cam follower at mean travel and lift.

Design Simplified

$$\text{lobe height } l = \frac{(r_2 + r_3)(r_1 + r_4)}{(r_4 - r_3)} - (r_1 - r_2) \dots (5)$$

Therefore, for any angle θ , the lift expressed by equation 5 always represents a fixed relationship for these four variable radii.

If the base circle, lobe height and follower radius already have been selected to meet certain design requirements, then for a given angle θ the exact tip radius for the relationship shown may be computed by the following equation,

$$r_2 = \frac{0.5r_1(1 - \cos\theta)(2r_1 + 3l) + 0.5r_3(2r_1 + l) + (r_1 + r_3 + l) - \cos\theta(r_1 + r_3 + l)}{1 - \cos\theta}$$

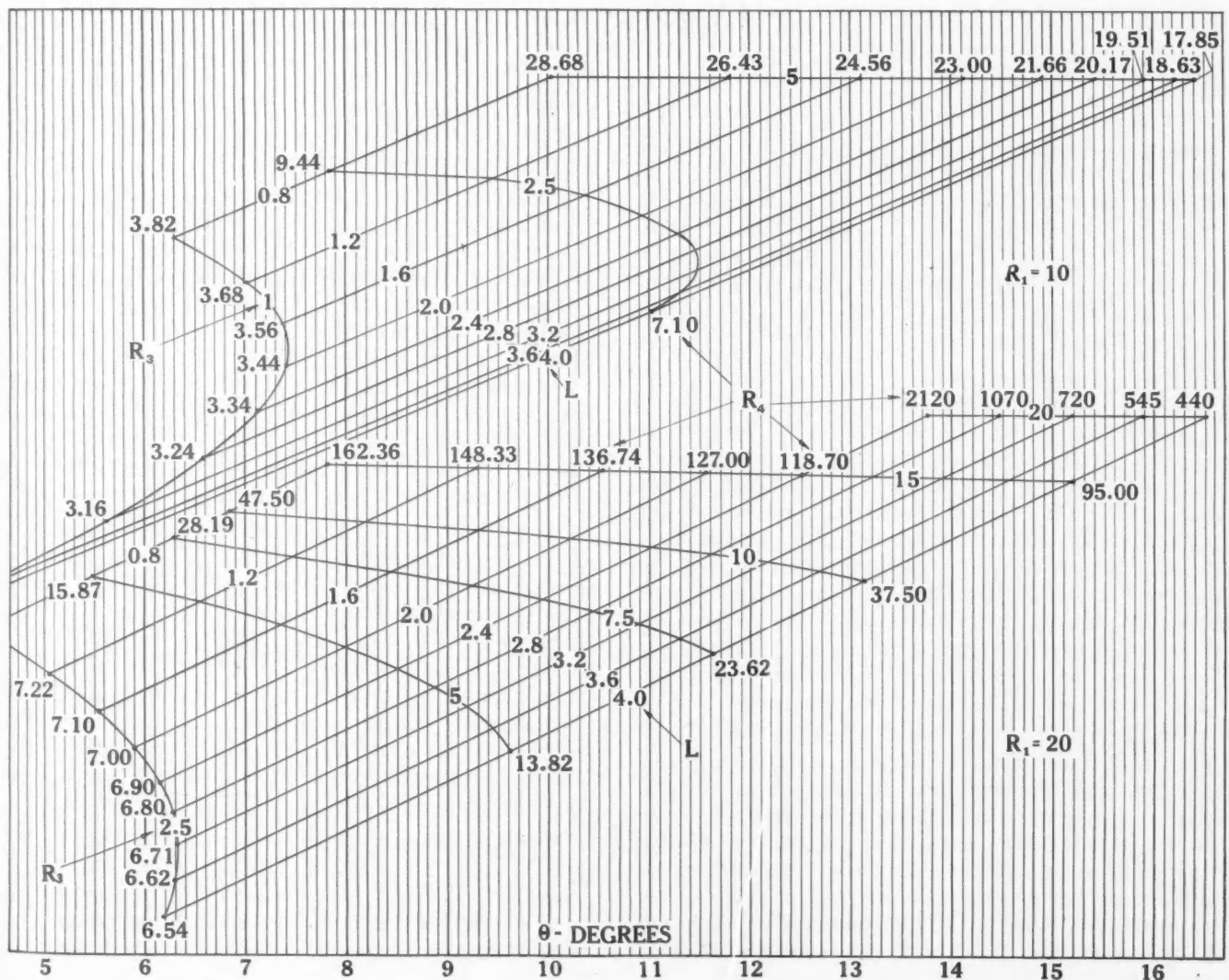
$$\frac{0.625l^2 - \cos\theta(r_1r_3 + r_3l + l^2/2)}{l/2} \dots (6)$$

With the tip radius known, the flank radius may be determined by substituting in the expression

$$r_4 = \frac{r_1(r_2 + 2r_3) - r_3(r_2 - l)}{r_1 - 2r_2 - r_3 + l} \dots (7)$$

In order that it may be possible to determine fairly

Fig. 2. Relationships of variable cam factors when the base circle radius is 10 and 20 times that of the tip radius.



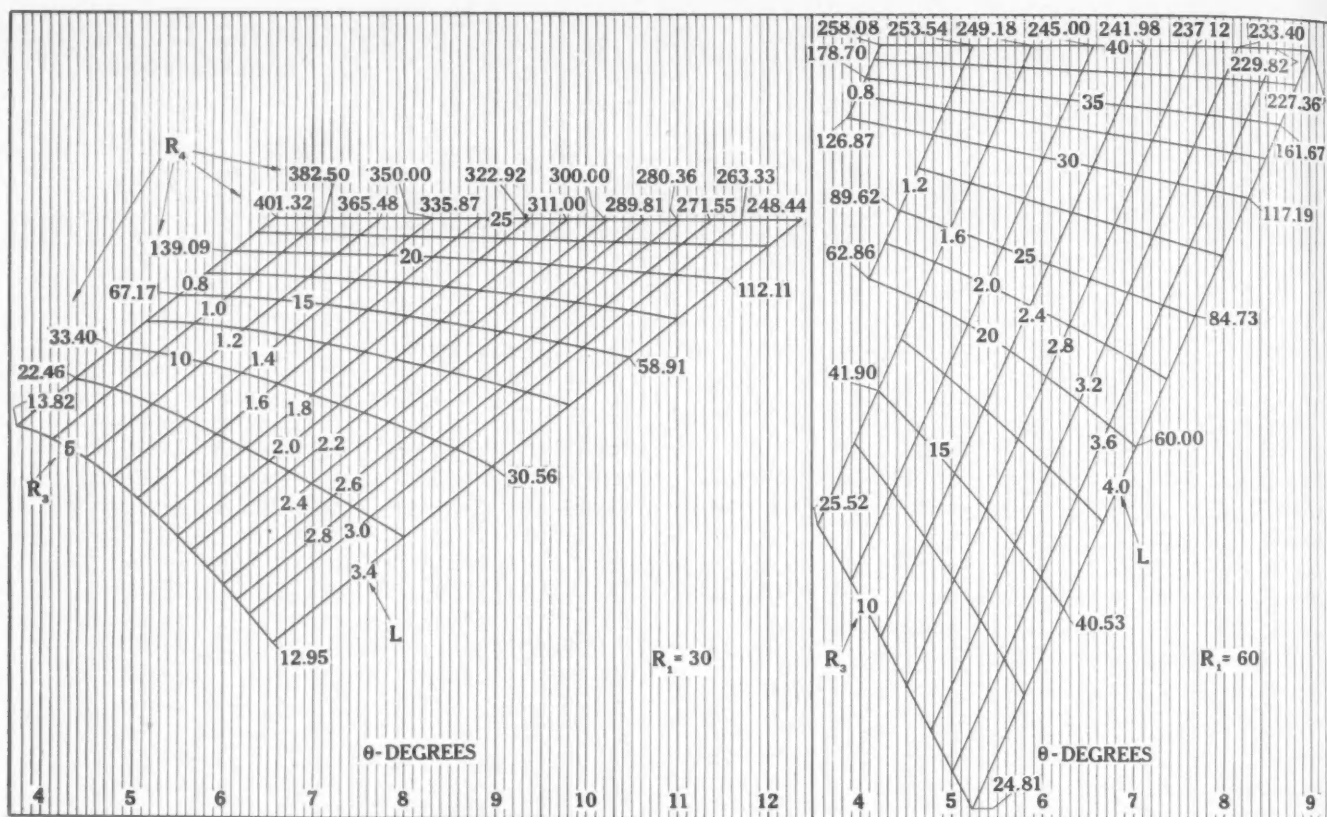


Fig. 3. Relationships of variable cam factors when the base circle radius is 30 and 60 times that of the tip radius.

close approximations quite readily for each of the four radii and the lobe height at any angle θ , the charts shown by Figs. 2, 3 and 4 were prepared. In this instance the treatment is concerned with ratios. Although r_2 is perhaps the radius of least importance, it was chosen as unity since it is generally the smallest dimension and it is always more convenient to deal with whole numbers.

In the diagrams, $R_1 = r_1/r_2$, $R_3 = r_3/r_2$, $R_4 = r_4/r_2$ and $L = l/r_2$. The six diagrams represent values for R_1 of 10, 20, 30, 40, 50 and 60, respectively. The lines whose general direction is mostly horizontal represent various values for R_3 . The diagonal lines represent various values for L . Values for R_4 are placed about the perimeters of each diagram so that intermediate points, or even points outside the diagrams, can be determined sufficiently close for the intended purposes by interpolation. The same is true, of course, for all intermediate values of R_3 and L . Other values for R_1 may be ascertained with reasonable accuracy by interpolating between any two diagrams.

The angle θ is a fixed quantity for any valve opening period according to the relative rotative speed of the cam. It is understood generally that when a cam of a radial engine rotates in the same direction as the crankshaft its relative speed is always $1/(n+1)$, and it is $1/(n-1)$ for the opposite direction of rotation, n being the number of cylinders. Also, the number of lobes in the first case is $(n+1)/2$, and in the second case $(n-1)/2$. Cam speeds as high as one-fourth are infrequently found among modern de-

signs, therefore the charts should be useful for studies of practically all radial engines having normal valve opening periods.

To illustrate how the charts may be employed for preliminary design purposes, and to save hours of valuable time that otherwise might be consumed in calculations, a hypothetical nine-cylinder engine whose cam ring rotates at one-tenth crankshaft speed is taken as an example. The valve of this engine is to have a total opening of 280 deg of crankshaft rotation, hence the included cam lobe angle must be 28 deg, and θ must equal seven deg. Somewhere along one of the vertical seven-deg lines, it should be possible to find a combination of variables that satisfies the requirements of the design.

Some of these variables are more or less fixed by actual design limitations. For example, suppose the height of the cam lobe is to be 0.34 in., and it is preferred not to have a tip radius less than 0.10 in. In this instance, the value of L may be taken as 3.4. Also, suppose that the layout calls for a base-circle radius of approximately 4.0 in. It follows then that R_1 may be assumed to be 40. By reading up along the seven-deg line of the chart $R_1 = 40$ until the line representing $L = 3.4$ is reached, R_3 is 10, or $r_3 = 1.0$ in., and R_4 is 27.52, or $r_4 = 2.752$ in.

Other relationships may be secured in like manner if it is desired to ascertain what effect the change in one dimension may have upon others. However, only a few such determinations should be necessary before a suitable combination may be selected, and this in only a small fraction of the time required to ar-

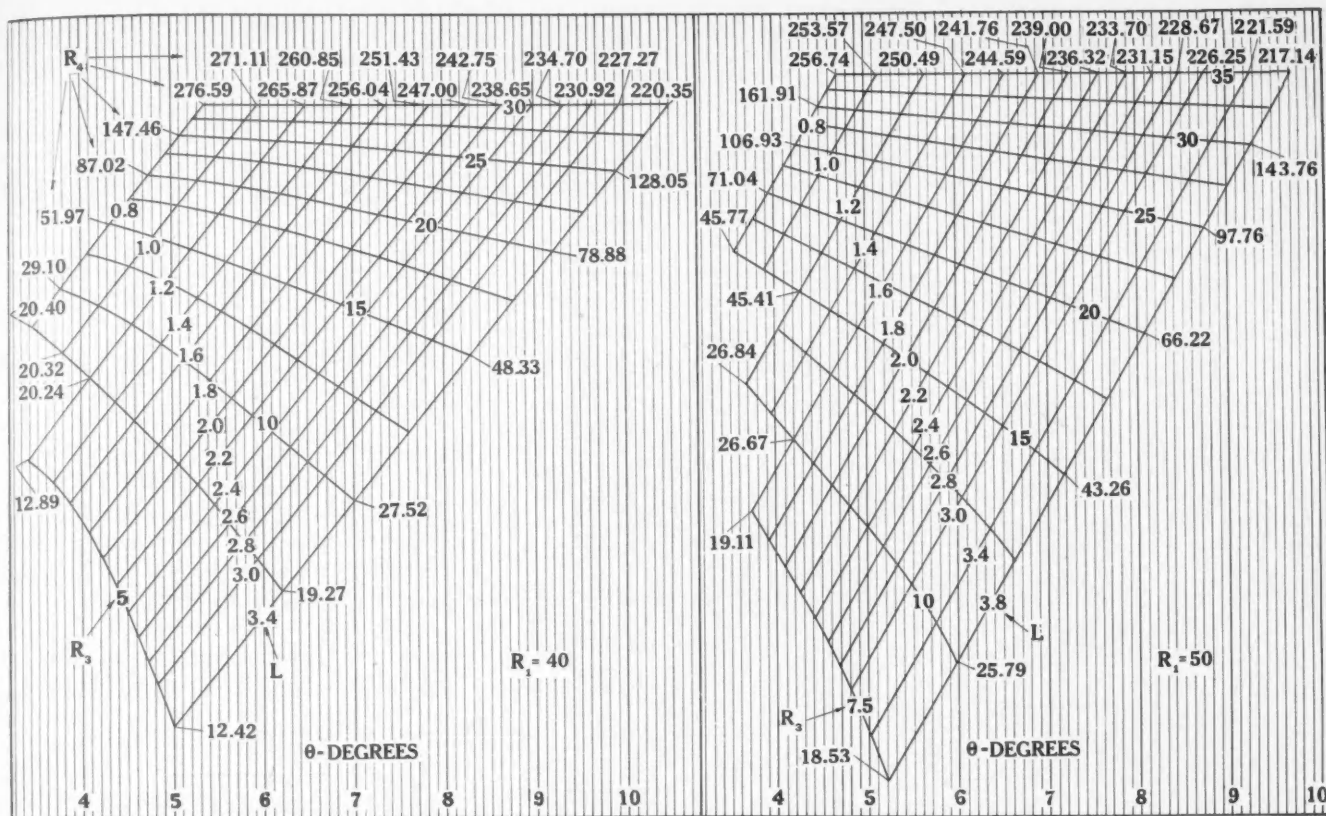


Fig. 4. Relationship of variable cam factors when the base circle radius is 40 and 50 times that of the tip radius.

rive at the same result by trial and error methods, either mathematical or by large-scale layout.

While it is true that values read from a chart are at best approximations, these should be close enough to permit final selection of at least four variables and then solve for the fifth by means of equation 5. Equations 2 and 4 may be employed as a check if desired, but dealing with the cosines of small angles takes considerably more time and introduces greater possibility of error.

It might be well to call attention to some rather significant facts which the charts illustrate. For instance, smaller values of θ call for relatively smaller lift ratios for a given base circle. Increase in the diameter of the base circle for a given angle θ results

in larger follower and flank radii for a given ratio of lift. If the follower is to be a roller, then for a given lift ratio the trend is toward a relatively smaller base circle. As a follower radius is made proportionately larger, as in the case of a shoe type follower, it is evident that the flank radius becomes larger at a gradually increasing rate; in fact, just outside the charts it becomes infinity and represents a tangential flank. Many such observations may be made with respect to any one or more fixed conditions called for in a design, thereby enabling ready determination of the limits for all other variables.

Part II will appear in an early issue of AUTOMOTIVE INDUSTRIES.

Direct Personal Taxes Amount to \$125 Billion for Seven-Year Period

INDIVIDUAL taxpayers, by the end of 1948, will have paid nearly \$125 billion in direct personal taxes since World War II began, according to *Domestic Consumer Markets*, a chart book prepared recently by the National Industrial Conference Board. Last year, the Board points out, taxpayers paid in direct personal taxes more than they spent for all of the following: new homes, new cars, new furniture, religious and chari-

table purposes, private education, and medical care and death expenses.

Individuals are spending a lower percentage of their incomes for consumption than in previous peacetime years, the Board finds. "They are setting aside a slightly higher percentage for savings, but the major factor in shrinking the proportion of income left for voluntary expenditures is higher personal taxes." Direct personal taxes, after the recent

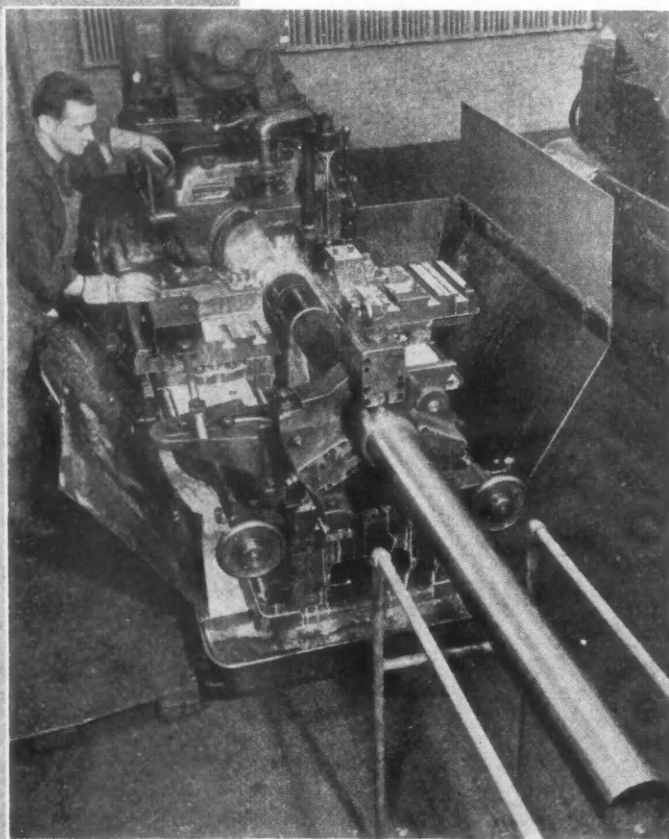
tax reduction, "equal ten cents a dollar of income, or triple the tax slice in 1929 and 1939. In dollar terms, personal tax payments are about \$20 billion greater than in either of those earlier years."

Taxes and savings combined, it was found, now account for "about one of every six dollars received by individuals." Before the war "only one

(Turn to page 68 please)



The folded halves of the shell are seam welded together.



Machining the alloy steel forging that becomes the internal spar.

A New Type

DESPITE present widespread interest in jet propulsion as aerial motive power, announcement by Hamilton Standard Propellers, Division United Aircraft Corp., of the development of a new type of screw propeller has aroused keen interest among aeronautical engineers. Military airmen are finding in it possibilities for larger aircraft, to carry heavier loads, and the promise of certain savings and economies in operation that will make for increased efficiency.

The new propeller, of hollow steel, brings out no new principles of aerodynamics. It is quite conventional in design, but embodies new features of construction that permit substantial weight savings without sacrifice of strength—a combination that is the goal of most of the designer's work. The result is achieved by an unusual combination of materials, with fabricating methods equally as unusual.

Starting with wooden propeller blades for the aircraft of World War I, the higher-powered engines of the postwar period led to the development of the solid forged blade of aluminum alloy. As engines of 2000, 2500, and 3000 hp were built to drive the larger planes of the late 1930's and early 1940's, the solid forged blade of aluminum began to approach its practical size limit. The difficulty was that weight was proportional to volume, and increased rapidly as the length of the blade increased. As propellers reached diameters of 12 to 13 ft, a new approach to the problem became a necessity.

Weight in a hollow blade is approximately proportional to the surface area if the thickness of the skin is kept small. Lack of strength and rigidity proved to be the chief difficulties with the early hollow blades. Steel was chosen for the blade, but the thin wall showed a tendency to flutter when the load and velocity were high. An internal stiffening member greatly increased strength, but there arose the difficulty of de-

of Hollow Steel Propeller Blades

Weights Savings Achieved by Unusual Combination of Materials and with Fabricating Methods Equally as Unusual

By Kenneth Rose

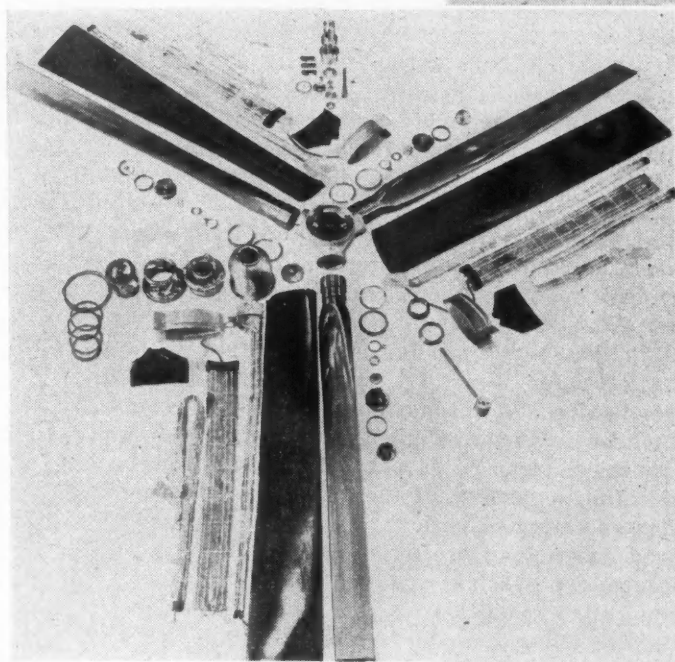
termining when the internal member was firmly bonded to the shell. Also unsupported areas of the shell still showed a tendency to flutter.

The blade developed by Hamilton Standard is made with a heat-treated alloy steel shell, an internal spar running the length of the blade and joined to the shell throughout its length, and a filler of foamed vulcanized rubber to fill the space between the spar and the shell. Several other features have been added, taking advantage of a weight saving of over more than 200 lb per propeller in the size used on the B-29. Use of hollow steel construction has permitted the building of a broad, square-tipped blade, considerably more efficient than the design customary with the earlier blade.

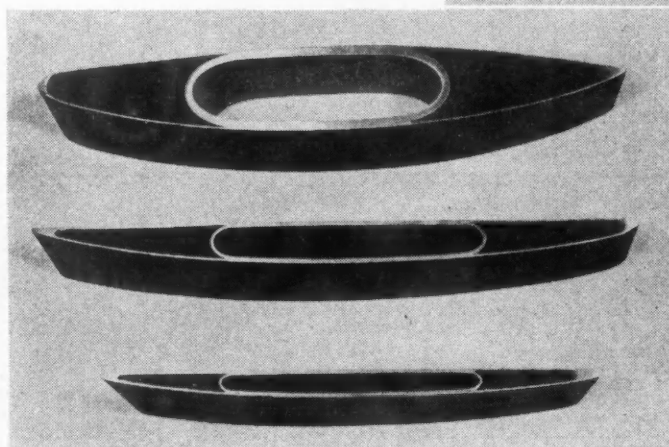
Construction of the shell of the hollow steel blade starts with chromium-nickel-molybdenum steel sheet. The rough outlines of both surfaces of the blade are stamped on the sheet so that they have a common edge, and the sheet is then folded along this edge to form the shell in the rough. Tack welding holds the sheet in place, and a seam welder welds the open edges, after which the shell is trimmed. To provide greater service life, a fillet of copper alloy is melted into the leading edge.

The problem of forming the thin steel shell accurately to the blade contour without collapsing kinking it was one that was solved only after the development of a huge furnace-and-press combination. Movable furnaces are placed on rails directly under a 500-ton hydraulic press so that the heated shells can be moved from the furnaces immediately to the press dies, before the thin metal can

(Turn to page 86, please)



Cross-sections of the completed blade cut at several points along its length show the contour of the surfaces and the filled portions of the blade.



The finished propeller is an elaborate structure, with internal de-icing, oiling, pitch control mechanism, and an unusual combination of materials.

Small Lightweight Engine Employs Aluminum Alloy for Principal Parts

A SMALL engine of unique design is being placed in volume production by the Leading Engine Co., in a modern straight line process plant located in the Detroit area. Intended for the industrial market, the engine is of single cylinder, aircooled, four-cycle type with major parts of aluminum for light weight. The basic engine is rated from 1½ to 2 hp at a governed speed of 2700 rpm. By replacing the cylinder assembly and piston the same basic engine can be converted for a power rating of 2½ to 3 hp. It is claimed the design produces a BMEP of 90 psi.

As illustrated, the cylinder, head, and crankcase are separate aluminum castings to improve manufacturing, reduce operating temperatures, and facilitate conversion from one rating to another. The cylinder has integrally-cast cooling fins of large area with cored passages for directing air flow around the cylinder and valves. A chrome-moly alloy steel sleeve is cast integrally with the cylinder.

The crankcase sump is of parabolic shape to assure lubrication regardless of the position of the engine under operating conditions. The aluminum connecting rod has a long projection on the lower end of the bearing cap which serves as a scoop for splash lubrication and, in addition, is rifle drilled into the bearing cap so as to carry oil into the bearing.

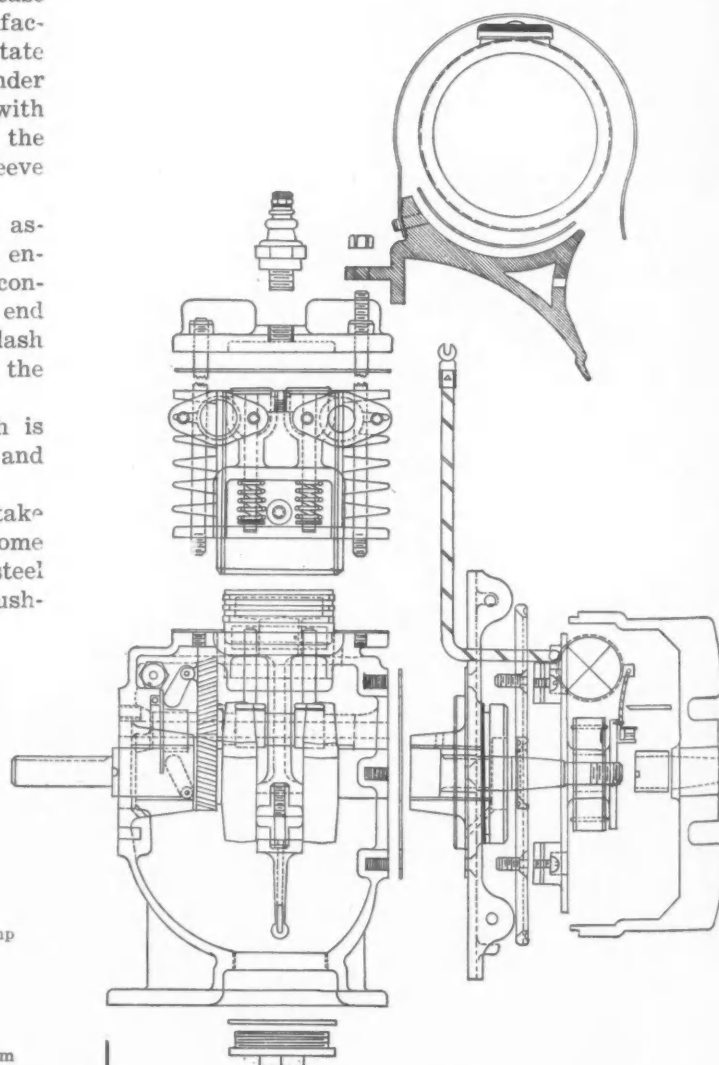
Cooling air is provided by the flywheel which is machined internally and externally and balanced, and has integrally-cast cooling fins.

Automotive type poppet valves are used for intake and exhaust; alloy steel for the intake and Silchrome for the exhaust valve. Valve seats are alloy steel inserts. Valve tappets are of non-adjustable mush-

room type, hardened and ground. An easily-removable cap containing three variable thickness spacers is inserted over the end of the valve stem to provide a means for maintaining proper clearance between the valve and tappet. The camshaft is of alloy steel, driven by involute helical gears of alloy steel.

The crankshaft is made of an alloy steel forging having integral counterweights with journals and pin one-inch in diameter. The forging is heat treated and Tocco hardened. The two main bearings are of

(Turn to page 56, please)

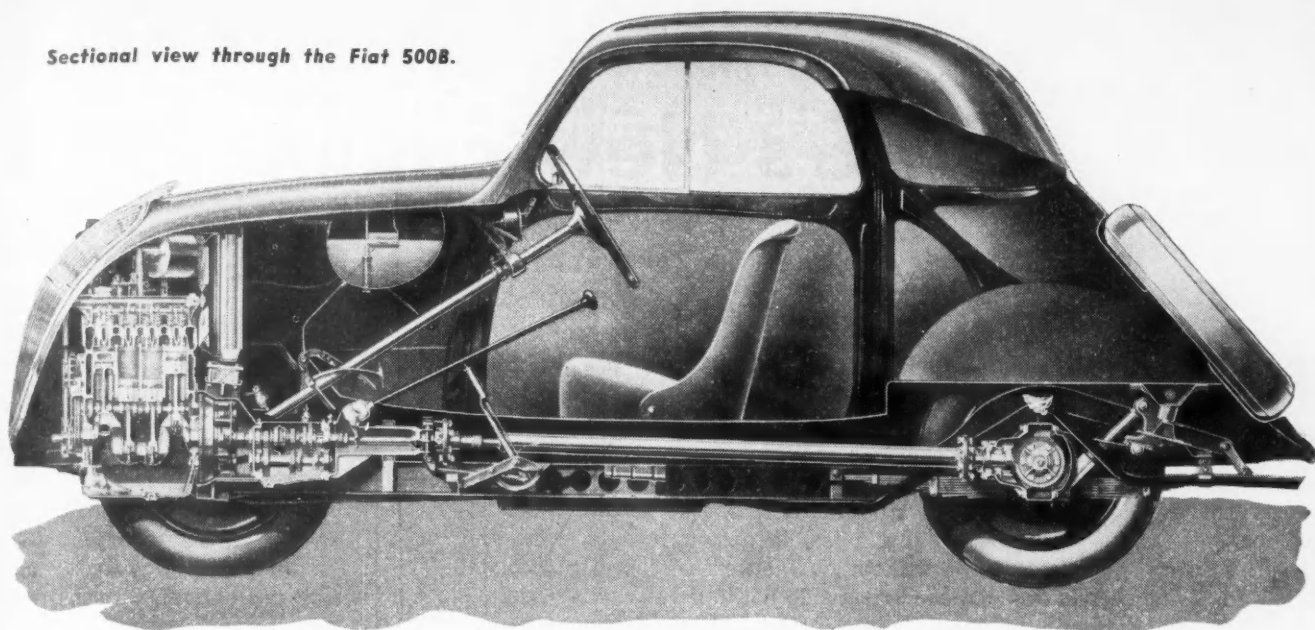


Leading Engine Specifications

	1½ to 2 hp	2½ to 3 hp
Stroke, in.	1¾	1¾
Bore, in.	2½	2¾
Displacement (cu. in.)	6.65	8.31
Compression ratio	7.2	7.2
Main bearings	2	2
Weight, lb.	34	34.5
Rated hp at	2700 rpm	2700 rpm

Exploded longitudinal section of Leading engine showing details of construction

Sectional view through the Fiat 500B.



Fiat's Improved "500" Gives 54 MPG in Test

THE latest addition to the Fiat line of small cars is the Model 500B, which is essentially an improved edition of the Fiat 500, also known in Italy as the Fiat Topolino (Mickey Mouse). Im-

provements have been made throughout the car, including a new overhead valve engine equipped with a downdraft carburetor, oil filter, and a larger generator. The fan, located at the rear of the engine, is driven by a shaft which passes longitudinally through the cylinder head cover.

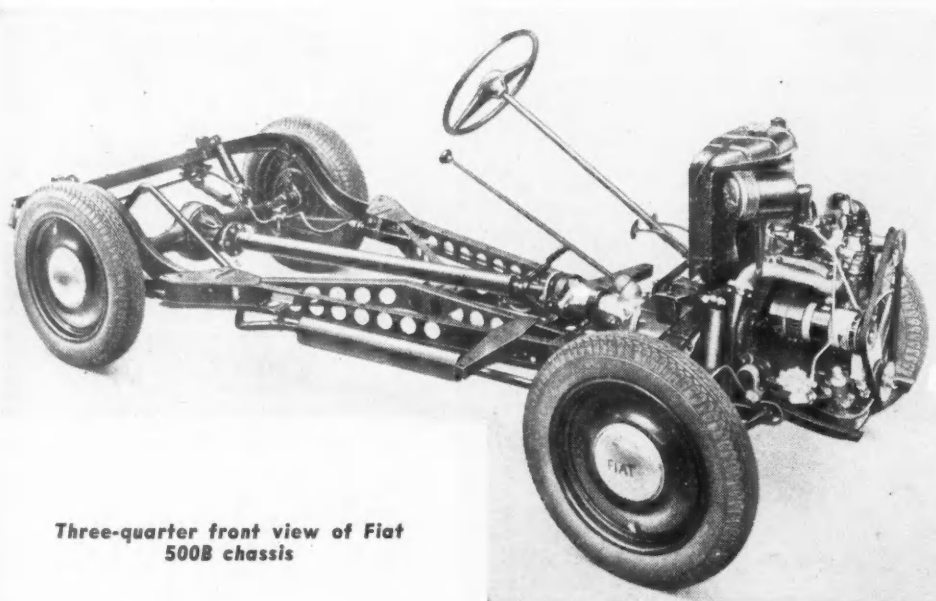
French Gasoline Economy Tests

	Passenger Cars	MPG	Average MPH
Simca-S	7	39.08	33
Citroen	9	28.14	39
Citroen	5	32.24	40.2
Citroen	5	26.88	39
Simca-Six	2	54.18	31.7
Simca-Six	2	52.44	31.7
	Trucks		
Renault 1-ton	1 ton	20.87	31
Renault 1-ton	1 ton	20.63	32.5
Simca-Cinq	220 lb	47.40	31

Among the other changes are greater stiffness in the frame, a better suspension system with semi-elliptic replacing quarter-elliptic springs, sealed clutch thrust bearing, and stronger transmission gears. The independent front suspension at the front remains the same. Top speed of the 500B is reported to be 60 mph as compared to 53 mph for the former 500 model.

In the annual French gasoline tests the greatest distance covered was 54.18

miles to the American gallon by a two-seater, four-cylinder Simca-Six, which is the 1948 French edition of the Fiat 500 now produced with overhead valves. This model came on the market some 15 years ago with an L-head engine of 34.7 cu in. displacement and has proved to be the most successful car of its type in Europe. The claim that it is both faster and more economical than the older model was proved in this competition. The results obtained by the nine competitors in the (cont'd on page 56)



Three-quarter front view of Fiat 500B chassis

GMC's New Engine Plant

By Joseph Geschelin

LATEST of the manufacturing units recently placed in operation by GMC Truck & Coach Division, General Motors Corp., is the self-contained engine building now housed in a modern two-story plant measuring 420 by 720 ft. An interesting feature of the layout is that the building is located on the side of an elevation making possible direct truck delivery of parts to the first floor on the north side and to the second floor on the south side without

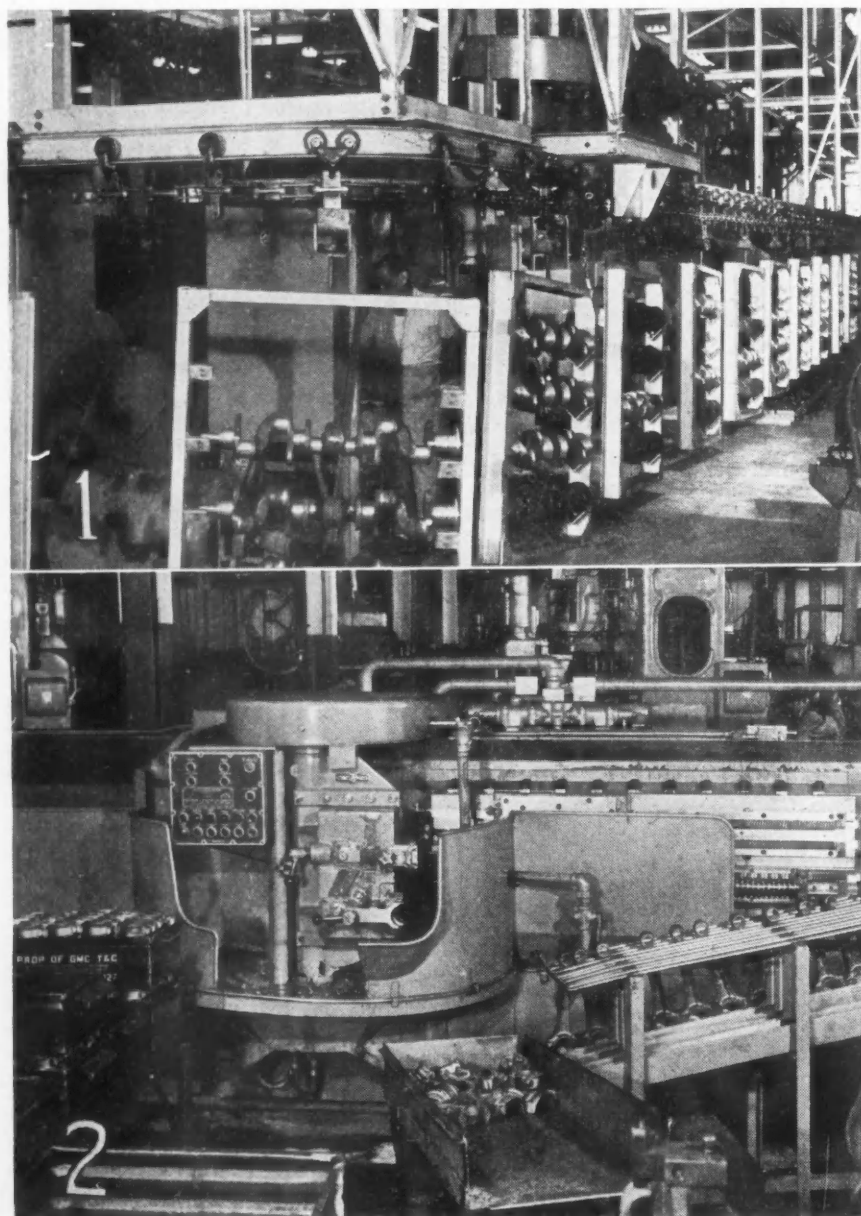
the use of freight elevators or ramps.

Taking advantage of these natural facilities, the first floor of the plant is devoted exclusively to machine shop operations and metal cutting, delivery of all raw materials being made directly to the first floor. At the same time all engine assembly, testing, trim, and storage are housed on the second floor entirely isolated from the machine shops, thus contributing to good housekeeping and cleanliness. By

virtue of this arrangement delivery of accessories and other purchased parts that go directly into engine assembly is made to the second floor by truck and rail thus permitting receiving, inspection and storage right at the assembly lines.

Since the centralized engine plant communicates with the adjacent truck assembly building it provides the most efficient arrangement of production operations and makes it possible to deliver engines to the assembly lines right off the trim lines by means of an engine delivery mono-rail conveyor running some 1500 ft.

Although much of the machinery found here represents equipment moved from the original engine plant, the operation includes a large investment in new machinery, about 75 per cent of the ma-



Perspective of one of the bays of the new crankshaft machining department, the variety of automatic turning machines and grinders being circumscribed by the heavy duty monorail feeder conveyor.

Close-up of work station of the big horizontal Cincinnati Hydro-Broach designed for surface broaching connecting rod big ends and caps. As shown, the fixture holds two pieces at a time for presenting the work progressively to the upper and lower tools on the ram which may be seen at the extreme right.

Now in Full Operation

Modern Equipment and Efficient Arrangement of Facilities Contribute to High Output of Gasoline and Diesel Engines

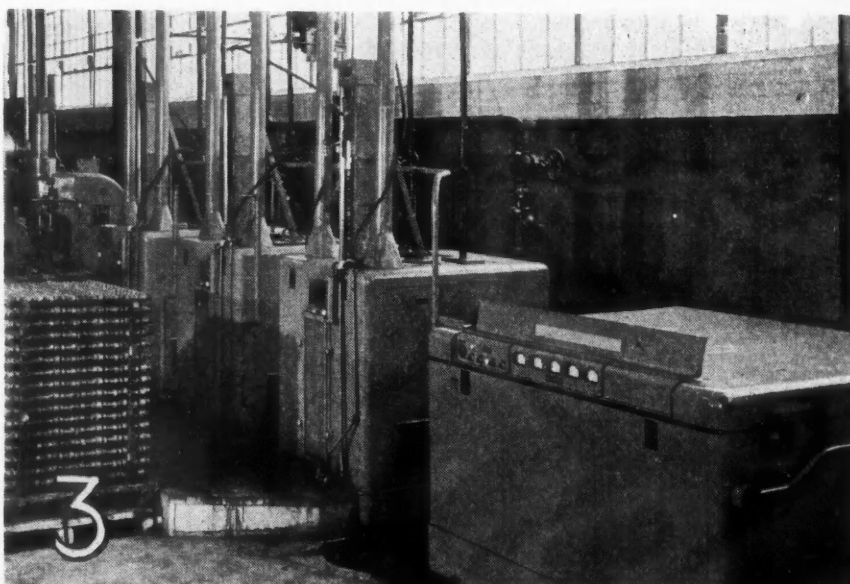
machines for the large engines being entirely new. In addition there are new lines for crankshaft and camshaft machining and heat treatment.

To cope with the management problems of building a varied line of gasoline engines with the many variations specified by individual customers, production equipment in the main is of general purpose type capable of quick changeover from one part to another. For this purpose multiple spindle drill presses, for example, are provided with separable cluster plates making it possible to drill a variety of parts on the same machine simply by changing plates and fixtures if need be. Similarly more complex equipment such as a crankshaft turning lathe is capable of handling a variety of shafts simply by a change of chucks and tooling.

Efficiency has been gained by grouping machines into departments for major parts and by separating the small-volume, large engine parts from the relatively high-production, small engine parts. Wherever feasible the machines in each department, or at least lines of machines, have been connected by gravity roller conveyors to facilitate movement of work with-

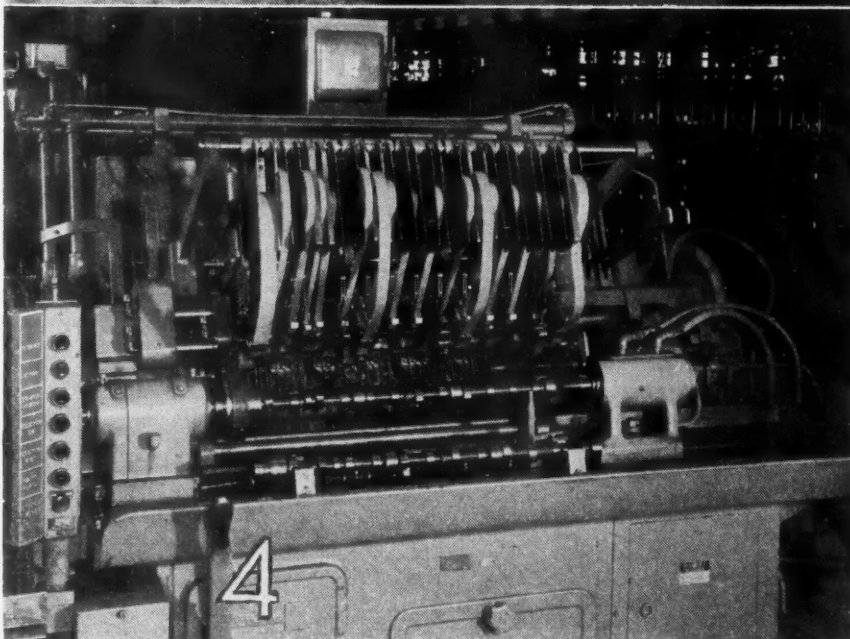
out manual handling and without the use of hoists and trolleys.

Several pieces of new equipment are rather unique and are illustrated here. For example, Tocco hardening units are employed for hardening crankshaft pins and journals; and (*Turn to page 80, please*)



Here is a battery of three Tocco hardening and quenching machines for camshafts. In the loading position camshafts are placed in the fixture in vertical position as may be seen in the machine at the right. The control cabinet for this battery is the unit at the extreme right in the foreground.

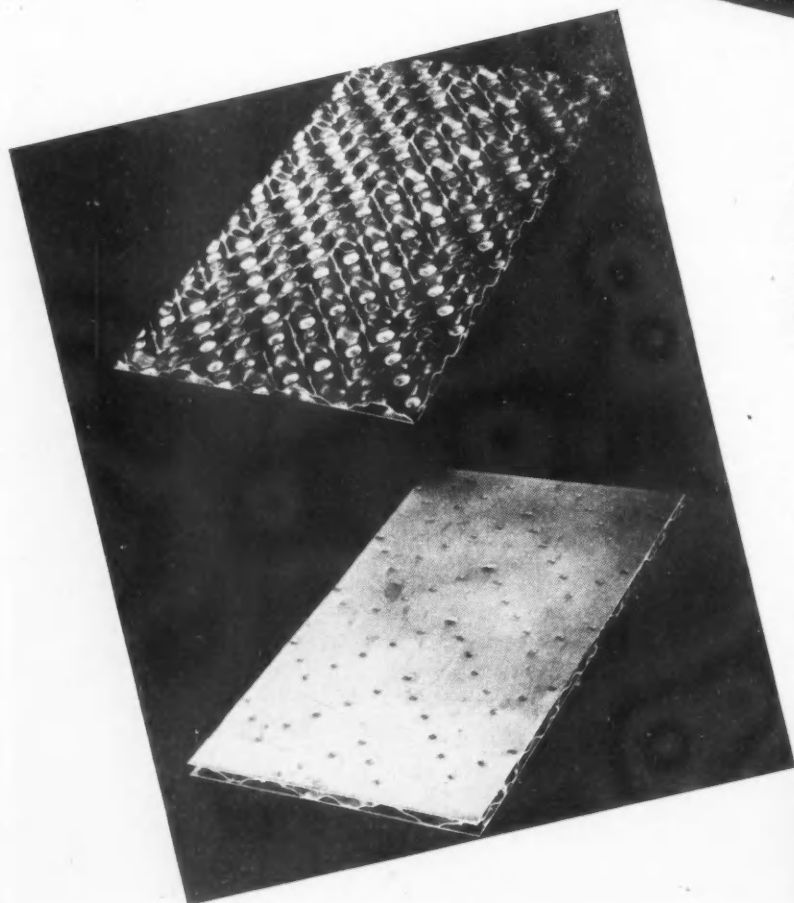
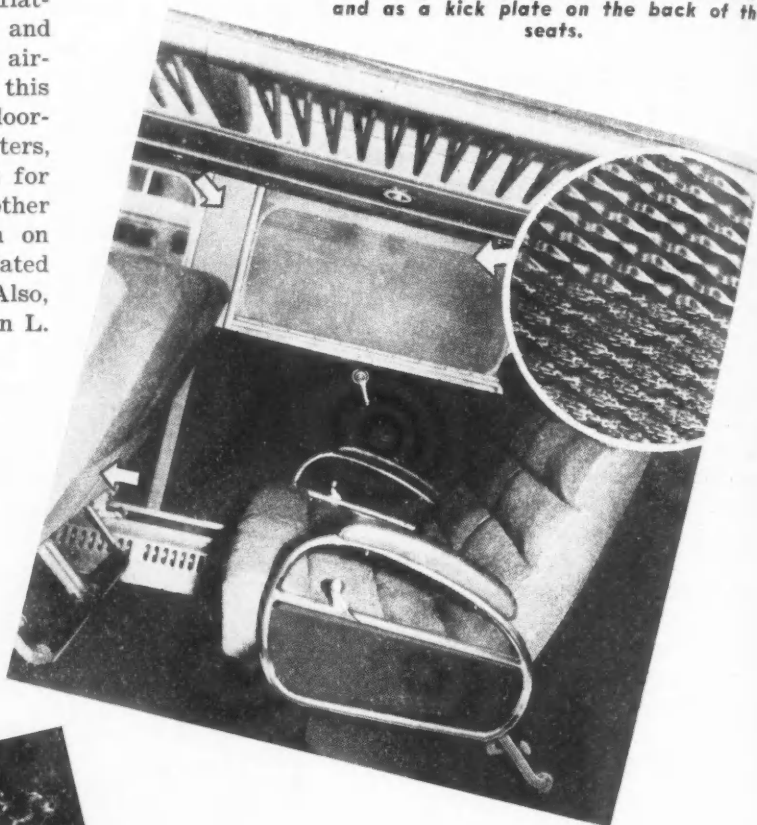
Painstaking attention is given to the surface finish of crankshaft journals, and bearings and cams of camshafts. Here is a view of the familiar Schraner polishing machine adapted for finishing camshaft cams and journals.



Rigidizing Finds New Applications

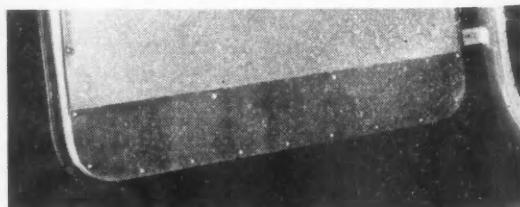
RIGIDIZING, a pattern process of design-strengthening ferrous and non-ferrous flat-rolled metals, is finding numerous structural and decorative applications in the automobile and aircraft industries, as shown by the photos on this page. Various Rigidized Metals are used for flooring and kick plates in airplanes and helicopters, for sun screens in motor buses, body panels for trucks and radio grilles in automobiles. Another application includes a special deep pattern on laminated sheets which were used by Consolidated Vultee as a part of a wing de-icing system. Also, a special extra-deep design developed by Glenn L. Martin and Rigid-Tex engineers is seen as a possibility for aircraft framing and bulkheads, since it is reported to show an increase in flexural strength of over 1000 per cent in a triplex panel construction as compared with ordinary flat sheet of equal cross-sectional area and width.

Among the newest applications of perforated Rigidized Metal is this sun screen developed by the Twin Coach Co. Rigidizing together with perforating eliminates the annoyance of sun glare, but at the same time permits the passenger to see outside the bus. On this bus Rigidized Metal in one of its other forms is used in the paneling between the windows and as a kick plate on the back of the seats.



The Rigidized Metal duplex panel (top) was made from a special deep pattern sheet spot welded to a plain sheet. The triplex panel (below) consists of two plain sheets fastened to the Rigidized Metal sheet, one by spot welding and the other by blind riveting or cycle welding. This triplex lamination was developed by the Rigid-Tex Corp. in collaboration with Glenn L. Martin in an effort to provide exceptional strength in flat paneled areas.

A Rigidized Metal kick plate is attached to the bottom of the door of the Bell helicopter. This plate protects the door upholstery from damage and furnishes an attractive and durable trim.



Modern Trends in Instrumentation

By R. L. Galley

Instrumentation Engineer,
American Viscose Corp.

INSTRUMENTATION in industry is finding greater and more diversified application, due largely to the impetus given by war production. That effort was aided by new and improved instruments to a degree larger than most of us even yet realize.

Today the catch word is "Electronic". Some of the more important electronic type measuring devices finding increased usage in industry are briefly described here.

Television is now being used to permit viewing a hazardous operation without having to expose oneself. The Hanford Engineer Works of the Atomic Energy Commission was one of the first to use television for watching a dangerous process. One manufacturer of a boiler water level gage uses television to project the actual reading ten stories down to the firing aisle.

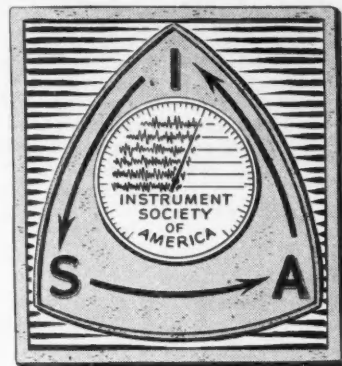
Temperature measurements are now possible to a degree of accuracy never before realized. One electronic temperature recorder produces a continuous record of the temperature of a liquid bath or of an object in an oven, by merely sighting the device on the object. Temperatures even below that of the room can be obtained by this method. Another model of this same instrument has been adapted, and is now actually being used on road tests to simultaneously

record several temperatures such as brake drum, cooling water, exhaust gases, lubricating oil, etc.

Moisture content can be quickly and accurately determined in pigments, sand, and other similar materials. Chemical purity of some liquids is easily measured, and if necessary controlled, through use of the property of electrical conductivity.

Thus an acid pickling bath can be automatically maintained at desired strength. The same property is used to indicate the level of a bath, and, if desired, to hold the level constant. It will also locate the "interface" (separation line between two liquids), and aid in the dewatering of fuel oil tanks.

(Turn to page 82 please)



Big Instrument Conference at Philadelphia Sept. 13-17

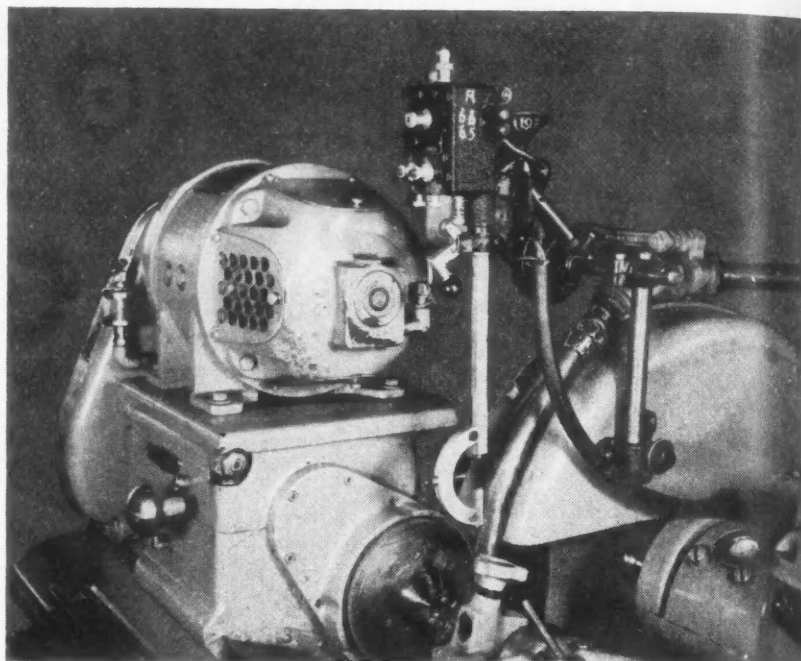
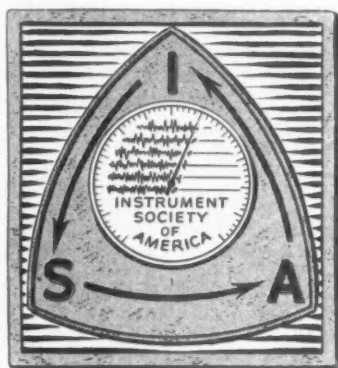
Thirty business and technical sessions are scheduled for the Third National Instrument Conference to be held Sept. 13-17 at Philadelphia's Convention Hall under the sponsorship of the Instrument Society of America with the cooperation of the American Institute of Physics, American Society of Mechanical Engineers, and American Institute of Electrical Engineers. The Scientific Apparatus Makers Association also will meet during the Conference. Between 10,000 and 15,000 instrument engineers and company representatives are expected to attend the affair.

In addition to the meetings, at which a number of excellent technical papers are to be given by experts in the instrument field, there will be a large exposition of instruments and devices for measurement, inspection, testing, and control. Booths have been reserved by 150 exhibitors, a list of which will be found in later pages of this issue.

AUTOMOTIVE INDUSTRIES salutes this young conference which was started three years ago and since then has had a phenomenal growth. On this page and on pages immediately following are published three special articles on industrial instrumentation, followed by a description of many of the new instruments and other products to be announced by various companies at the show.



This electrically-operated device installed on a grinder automatically controls grinding of work piece to size.



Instrumentation Is Key to Greater Economy in Automobile Production

By Robert B. Colten

Project Engineer,
Process Development Section,
General Motors Corp.

ISTRUMENTATION is vital to the solution of a major problem confronting the automobile industry today. The question is: How can we build more and better automobiles at a reasonable price? Faced with rising material and labor costs, we must find methods to improve our cars while increasing production. At the same time prices must be held down. The buying public is becoming increasingly price and quality conscious. The instrument man has an important key to the answer.

Instrumentation is a broad term which covers all devices for testing, inspecting, recording, and controlling. This fancy sounding word can refer to anything from a thermocouple for making simple temperature measurements to a complex system for controlling a whole process.

Mass production with high quality depends upon the ability to control the manufacturing process in every step from the raw material to the finished product. This was the secret of our ability to rapidly produce the weapons of war, which brought a speedier victory and therefore saved lives. The recent war demonstrated the importance of instrumentation and greatly advanced the art.

Instrumentation in automobile production begins in the steel mill where the composition of the steel is controlled by rapid and frequent spectro-

chemical analysis. The thickness and uniformity of sheet steel is likewise controlled automatically. It has been found convenient in many cases to run 100 per cent inspection of bar stock with magnetic and sonic instruments. These detect changes in the magnetic or sound transmitting properties of the metal.

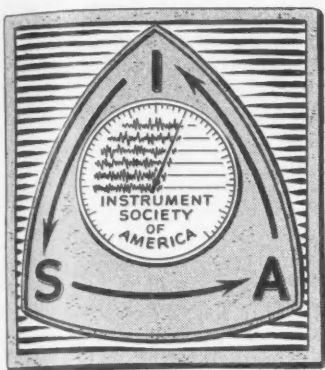
In the foundry again we find the spectrograph standing watch to insure uniformity of each batch of molten metal before it is poured. In a matter of a few minutes a quantitative analysis can be performed and corrections in composition can be made if necessary.

In the heat treatment of steels, instruments have become particularly important in controlling uniform time and temperature of the various processes. New induction and flame hardening devices have complex electronic controls. Time cycles are controlled much as they are on the new welding machines. The importance and feasibility of controlling welding time

cycles has been convincingly demonstrated.

The most significant trend in the fabrication of metal parts is the automatic control of machines. Whether this be accomplished by electric, air, hydraulic, or mechanical means, some form of instrumentation is involved. To control, we must first measure. Grinders, for example, which grind to size within a few ten-thousandths of an inch and automatically stop themselves, increase production and reduce worker fatigue. Another obvious advantage of these new machines is the elimination of scrap. This is significant in view of the high cost of labor and raw material. Many such machines are being used to manufacture writ pins, bearings, and similar precision parts.

Gaging has come a long way from the caliper stage, with the development of electronic and air gages. An excellent example of modern (Turn to page 67 please)



Rigid Aircraft Inspection Demands Scientific Instruments

By **W. E. Luff**, Chief Inspector,

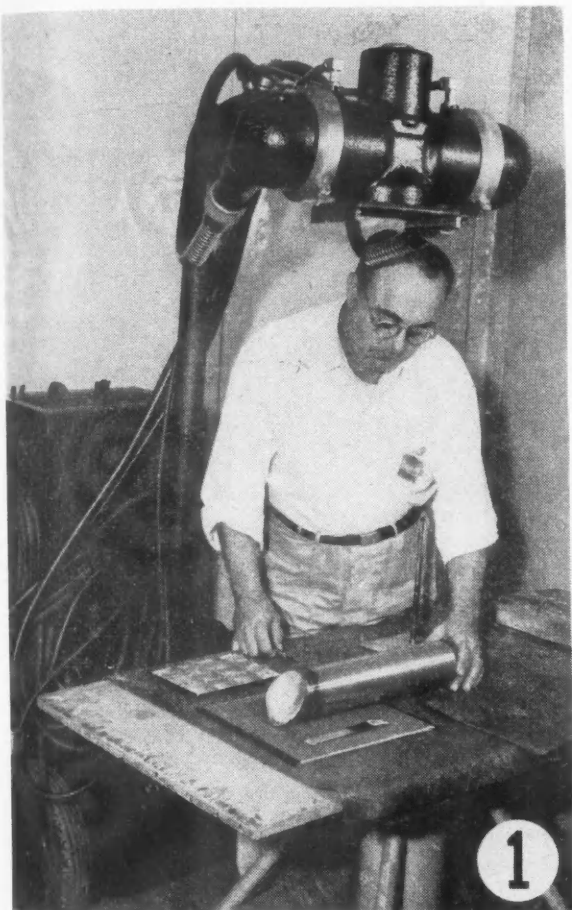
and **M. T. Shelhimer**, Asst. Chief Inspector,

El Segundo Plant, Douglas Aircraft Co., Inc.

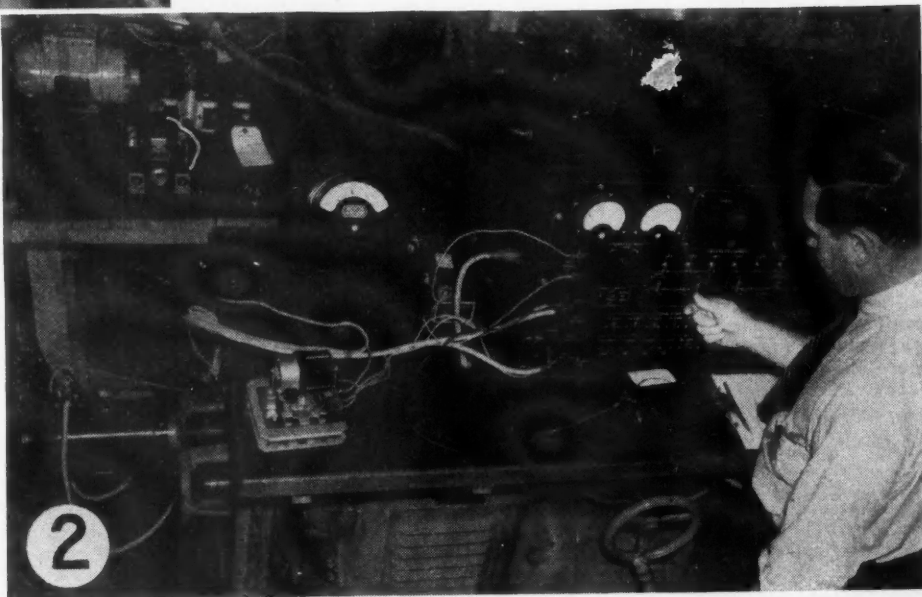
THE tremendous forward strides achieved in aircraft design and construction in the last decade have of necessity caused the fundamental requirements of aerodynamics, strength, weight, performance, and quality to become more and more critical. The result of these increasingly rigid requirements is a gradual but definite trend toward scientific and electronic methods of inspection applied both within the industry itself and upon raw materials and equipment items furnished by outside sources.

Originally the aircraft inspector was an individual of experience who was so close to all phases of construction

1—The introduction of X-ray to aircraft inspection provided a means of inspecting not only closed areas where normal inspection gages cannot be used, but also weldments which have always been an inspection problem. Equipment is mobile to allow factory-wide usage as required. Normal operation is confined to a lead-lined room using remote control.



2—Receiving-inspection test of electrical equipment. The importance of the individual electrical unit cannot be overemphasized, since unit failure generally results in system failure. Therefore, considerable time is spent in testing every phase of the unit's operation to insure compliance to specifications. To accomplish such tests accurately, actual aircraft conditions must be duplicated in the laboratory which results in complicated hookups and requires a thorough technical knowledge on the part of the inspector.



3—Functional testing of hydraulic units by the gang method. Since many hydraulic units such as check valves have multiple usage in an airplane, the number requiring test makes it necessary that the test equipment be readily adaptable to single or multiple arrangement in the laboratory. In this manner, the inspector can simultaneously test as many as five times the number normally tested on one unit.

of the airplane and its detail parts that he was able to use his own judgment as to the acceptability of a part based on his knowledge of its "end-use". His inspection methods were generally of the hand measuring type using destructive tests as necessary.

Today the airplane is a complex machine, made up of complicated mechanisms of fine machine work and interconnecting systems incorporating precision units to perform numerous functions. It is fabricated and assembled in hundreds of operations and processes, each in itself an important factor of the completed product. It is designed to perform and carry loads never before realized, a far cry from the early airplane, practically fabricated and completed in one location not too long ago. To parallel the continuous changes in design and construction, the aircraft inspector has been gradually transformed into a specialist, trained to inspect and adhere to mandatory requirements, using the latest equipment available to eliminate the element of human error.

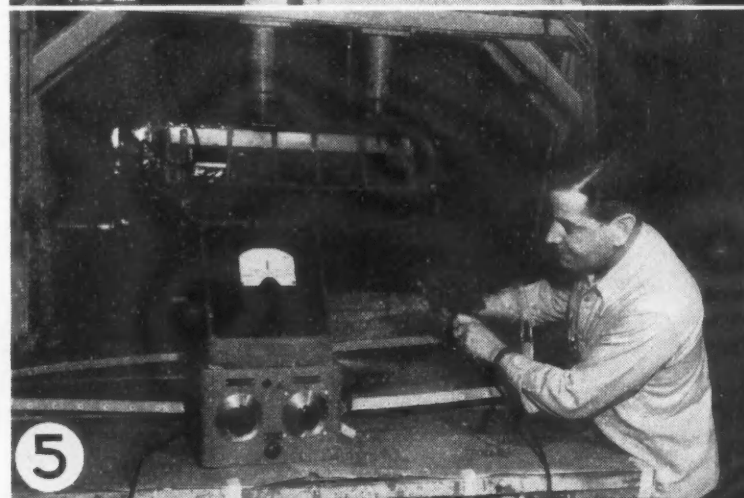
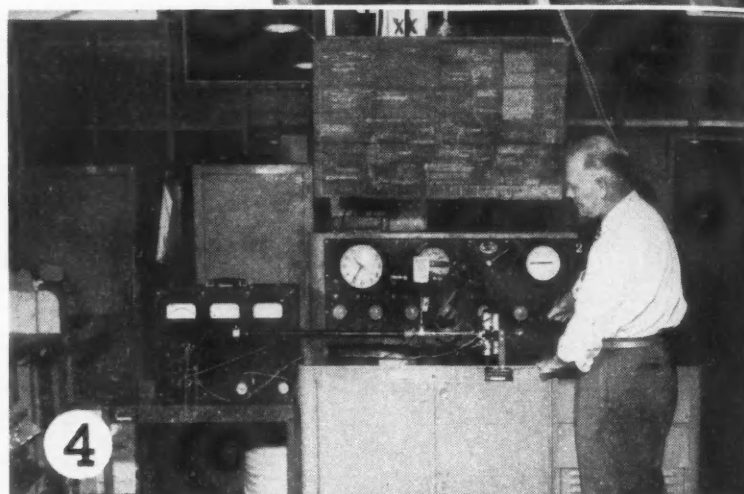
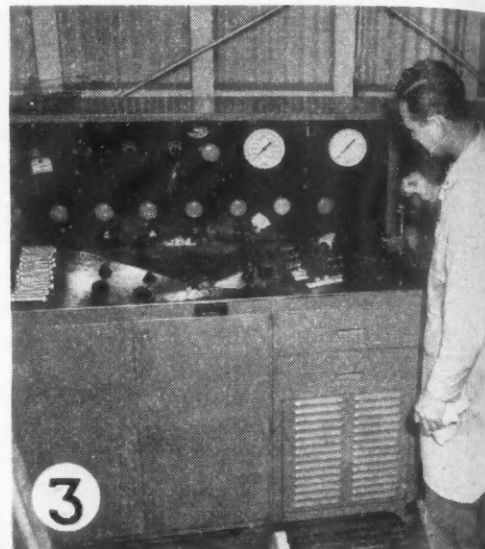
The transition to non-destructive inspection techniques has been gradual but constant. The use of Brinell and Rockwell equipment was one of the first steps in this direction. The introduction of Magnaflux inspection for determining surface and sub-surface defects in ferrous metals, and Zyglo for determining surface defects in non-magnetic materials, definitely aided the inspector in proving basic strength requirements in the materials used. X-ray and fluoroscopic inspection answered the question of defect detection in cast and welded materials, and provided a means of inspecting internal areas heretofore not accessible. The perfection of the optical comparator technique for dimensional inspection and the Profilometer for surface roughness conditions are invaluable assets

(Turn to page 88 please)

4—Testing combination electrical-hydraulic units. Today's aircraft design in many cases requires a unit employing both electricity and hydraulic pressure. To test such a unit the inspector must be able to determine the necessary arrangement of the equipment and to insure that both phases of the unit's operation are properly coordinated for sequence.

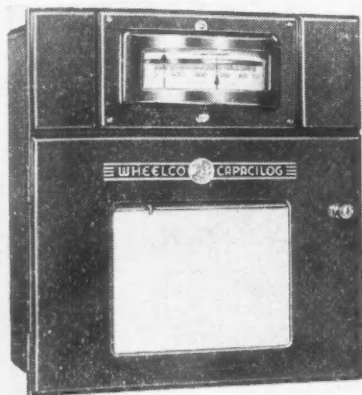
5—To inspect large or contoured areas of non-metallic materials, the inspector employs equipment such as the General Electric electronic gage shown here. Since in many instances non-metallic material must carry certain design loads, its gage accuracy is important as that of metallic material in the construction of aircraft.

6—Burst-pressure testing of hydraulic hose. The quality of hoses and their conformance to specification is a critical part of any aircraft system.



IS-1—Recorder For Heat Treating

A demonstration of a new recorder called the Wheelco Capacilog spotlights the Philadelphia exhibit of the Wheelco Instruments Co., Chicago, Ill. This instrument indicates, measures and controls, and permanently records industrial process variables such as heat treating of automotive



Wheelco Capacilog recorder

parts, using an electronically operated pen to guide the scribe in unison with the movement of the indicating pointer. Having no amplification, physical contact or disturbance of the measuring circuit, no converters, and no relays, it is said to result in accurate, simple and instantaneous response. The Capacilog is available with deflection and null type measuring systems, both systems using a positive power driven pen.

IS-2—Potentiometer Controllers

Adding to its extensive line of ElectroniK potentiometer recorders and controllers, the Brown Instrument Co., Phila., Pa., a division of Minneapolis-Honeywell Regulator Co., is displaying new strip chart models with proportional and mercury switch electric control at the September Instrument Society of America Exhibit in Philadelphia. The controllers are particularly applicable in the metals and ceramics industries for the automatic regulation of electric-operated final control elements, such as motorized or solenoid valves and the G-E Reactrol electric heating system.

The new models combine the high sensitivity of continuous balance measurement with the requirements for very accurate set point adjustment (to 0.10 per cent of scale) on a 11 in. indicating scale and long term continuous recording (as high as 120 hrs). All models have standard pen speed of 24 seconds for full scale

**NEW
PRODUCTS**

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travel and automatic standardization of the balancing circuit every 30 minutes.

The proportional control mechanism on display utilizes a unique gear arrangement to transmit motion from the shaft of the pen drive to the resistor contact arm which provides the proportional control action. The arrangement is designed to magnify any relative motion of the pen with respect to the set point index, thus providing more sensitive control response.

A new sensitive electronic balancing relay for use with electric proportional controllers is also on display, designed for integral mounting on the bottom of the control case.

The mercury switch mechanism likewise displayed utilizes the same gear arrangement as in the proportional controller to provide a highly sensitive means of actuating the mercury switches (0.12% of pen scale motion opens or closes the one-amp. single switch). A variety of contact actions are available with this mechanism to provide two- and three-position control action of motorized solenoid valves, fuel valves and other final control elements.

IS-3—Dual Titration and pH Meter

A new titration-pH meter appearing at the National Instrument Conference, and put out by Macbeth Corp., New York, N. Y., is a dual in-

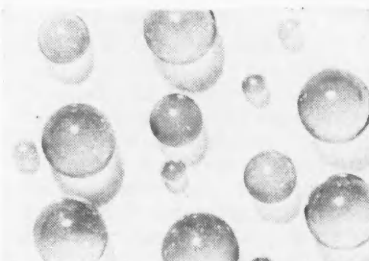
strument having an independent direct reading pH meter with continuous scale of 0-14. The titration meter controls are completely divorced from the pH meter section so that its one-knob control simplicity has been retained.

Simultaneous pH and oxidation reduction titrations can be made on the same sample. Separate pH and oxidation reduction measurements can be performed on two separate samples without interfering with pH standardization. Two pH glass electrode measuring systems can be used at the same time, one system adjusted for increased sensitivity.

Titration meter sensitivity is adjustable from plus or minus 120 millivolts to plus or minus 2 volts.

A polarizing current, adjustable from minus 7 milliamperes to plus 7 milliamperes is provided, permitting polarized electrode systems to be employed with no additional accessories. This affords maximum sensitivity for reactions such as involved in the determination of water using Karl Fisher reagent.

IS-4—Low-Friction Sapphire Balls



Linde synthetic sapphire balls

Synthetic sapphire balls polished to a sphericity of less than 10/1,000,000 of an inch, unaffected by acids and with a hardness second only to a diamond, are on exhibit by the Linde Air Products Co., Unit of Union Carbide and Carbon Corp., New York, N. Y. Applications of these low-friction, chemically inert and heat resistant spheres to specialized problems in engineering and chemical processes are claimed unlimited.

Standardization tests on Linde

Dual Macbeth titration-pH meter



sapphire balls show, in addition to their sphericity, a low coefficient of friction (0.140 for steel pivot in sapphire ring) and a hardness second only to diamond (9 on Moh's scale). Because these balls are uniaxial and homogeneous, their superior smooth surface cannot give rise to future areas of failure due to factors of stress or chemical action. Aging and creep phenomena do not appear in sapphire balls, the company states.

Experimentation has shown that sapphire balls are indicated for many high-temperature bearing assemblies, and for bearing installations subject to contact with chemical agents. In many such applications these bearings need not be lubricated, it is said.

Clear sapphire balls are being offered in sizes 1mm, 1/16-in., 1/8-in., and 1/4-in., dia.

IS-5—Stroboscope Flow Meter

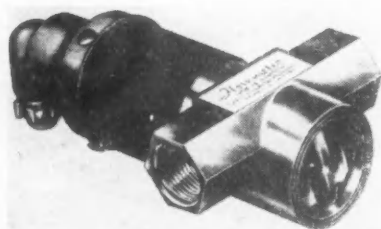
For testing flow rates of liquids or gases in radiators, fuel lines, hydraulic systems, etc., principally in the aircraft industries, the "Strobosc-flow", is being demonstrated by the Flowmeter Corp. of America, High Falls, N. Y.

A compact, portable unit, it may be connected in series with the flow line, and indicates, by means of a stroboscopic light source, the point at which a desired flowrate obtains within plus or minus one-fiftieth of one per cent. Interchangeable jets allow each instrument to operate over an unlimited number of flowrates within the range of the instrument.

The flow is displayed as a pattern of virtual images which fill the entire window of the instrument. The indications are not affected by changes in position, by vibrations, pulsation of the flowing fluid, acceleration, temperature, pressure, or by the specific gravity of the fluid.

Its primary function is for the reproduction of desired rates of flow, rather than for the indication of the value of unknown rates of flow. With a particular jet, eight distinct rates of flow may be indicated with great precision.

The "Strobosc-flow" comprises a jet, or nozzle, of known diameter, in



"Strobosc-flow" displayed by the Flowmeter Corp.

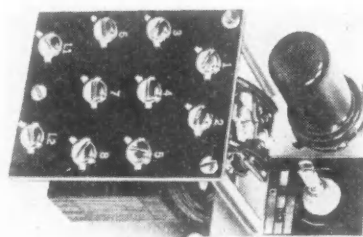
NEW PRODUCTS AT THE INSTRUMENT SHOW

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which the velocity of the flow will always be a linear function of the flowrate. Combined with this nozzle is a rotor or paddle wheel which engages the fluid emerging from the nozzle much as a pinion gear engages the teeth on a rack. The rotational speed of the rotor bears a linear relationship to the velocity of the fluid in the jet over a range which may vary from fifty revolutions to several thousand revolutions per minute. The calibration chart supplied with each instrument, incorporates a moveable straightedge, together with a third scale for viscosity, and this device makes viscosity compensation a matter of seconds.

A stroboscope light source flashing on and off at the rate of sixty times per second may be viewed through an opening in the rotor disc. When the rotor is revolving at the rate of sixty times per second (3600 rpm) it will appear to be stationary with the light showing continuously through the opening. The slightest departure from the rate of 3600 rpm will be evidenced by a precession of the rotor opening around the axis of the rotor, in a clockwise direction if the speed increases, and counter clockwise if the speed decreases.

IS-6—Sensitive Level Control

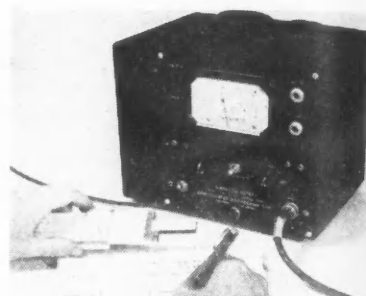


Leveltronic level control exhibited by R-S Products Corp., Phila., Pa., affords a sensitive, wide range system of level control using a thyatron tube to actuate a heavy duty relay through a bridge circuit. System is of the electrode type.

IS-7—Vibration Meter

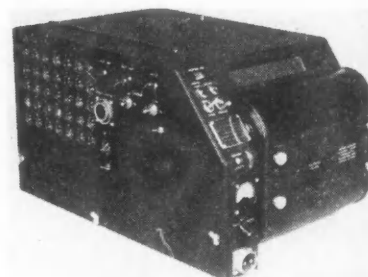
Type 1-110 vibration meter featured at the Show by Consolidated Engineering Corp., Pasadena, Calif., is a compact, portable, visual-indicating instrument to measure displacement (peak to peak) and velocity (average) when used in conjunction with self-generating velocity type pickups.

The meter is a complete, self-con-



Consolidated vibration meter

tained unit requiring no external accessories for operation other than a suitable pickup and cable. When such a pickup is properly connected and is attached to or held on any vibrating body, the meter on the front panel of the instrument provides an accurate indication of the amplitude or velocity of motion. The instrument may be employed to indicate practically any type of oscillatory motion. The connection of a cathode ray oscilloscope to the plug type connector provided on the front panel



Consolidated oscillograph

permits the study of various wave forms.

Additionally on display is the Company's type 5-115 recording oscillograph which records 36 independent points of intelligence with accuracy and fidelity. The 36 traces of the type 5-115 oscillograph are photographed on sensitized paper or black-and-white film. Operation with color film, permitting automatic identification of "scrambled" traces, is also a desirable feature. Thirty-six single input plugs to galvanometers are located on a panel on the left side of the instrument.

IS-8—Fixed; Adjustable, Time Relay

Sold to various branches of the automotive industries is this time relay manufactured by the R. W. Cramer Co., Inc., Centerbrook, Conn., which provides adjustable or fixed time relay between operation of a central circuit and subsequent closing or



Cramer time relay

opening of a load circuit. Specifically used in the control of plastics and injection molding, heat treatment, lapping, and grinding operations, the relay consists of a self-starting synchronous motor with a dust perfected gear timer, an electromagnetically operated clutch, a switch and tripping mechanism.

The clutch actuates two cup-shaped and precision cut gear members connected to the motor drive shaft through a small universal joint. A compensated leaf spring assures positive and quiet operation. The clutch provides automatic resetting in the Type TER relays.

The switch in the load circuit is a quick-make, quick-break type equipped with contacts rated at 10 amp at 115 volts, 5 amp at 230 volts and 3 amp at 440 volts. It operates satisfactorily under a 1/3 hp motor load, a 1200 watt heater load, a 250 watt incandescent lamp load, or with a solenoid in which the inrush current does not exceed 15 amp at 110 volts.

IS-9—Conductivity-and-pH Recorder

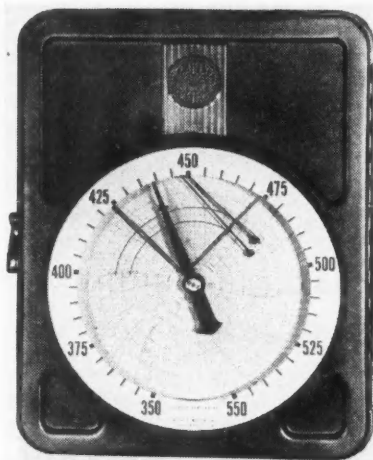
At the Third National Instrument Conference and Exhibit in Philadelphia, Bailey Meter Co., Cleveland, Ohio, is showing in actual operation for the first time their newly developed pH conductivity and smoke density recorders (illustrated). The pH and conductivity recorders are combined in one instrument, the recorder measuring both of these factors to obtain a full story.

Also spotlighted are the Bailey oxy-

NEW PRODUCTS AT THE INSTRUMENT SHOW

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gen recorder and area type fluid meter, each instrument embodying the same standardized electronic receiver. With various combinations of



Bailey combined pH and conductivity recorder

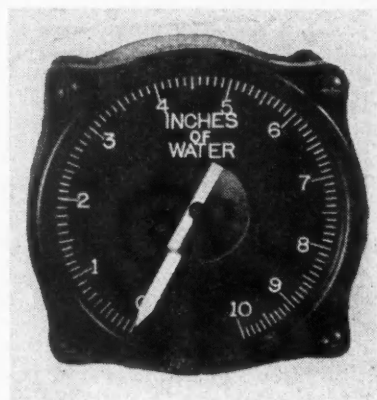
these units it is claimed possible to obtain over 100,000 measuring and controlling combinations. As many as four different factors may be continuously recorded on the same 12 in. dia uniformly graduated chart.

IS-10—Precision Low-Pressure Gage

Of primary interest to research engineers running tests on automobile engines at proving grounds, the (illustrated) precision low pressure gage being displayed by Wallace & Tiernan Products, Inc., Bellville, N. J., furnishes a portable instrument said to have the sensitivity equivalent of a liquid column. Adapted, too, to aircraft flight tests and wind tunnel work, it can be furnished as a compound gage with zero center for measuring both pressure and vacuum.

Mechanism consists of a pressure sensitive element, lever system, point-

er and dial. Beryllium copper capsules connected in series serve as the pressure sensitive element. Connected to this element through a flexible hinge type pivot, and serving to transmit capsule motion to the pointer, is a pinion and sector gear. Backlash is eliminated by the use of a filament attached to the

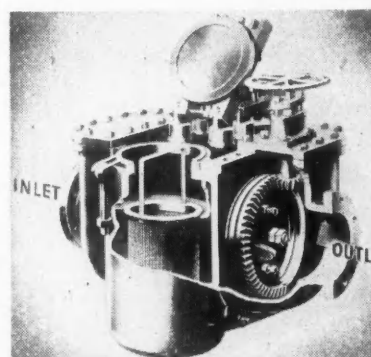


Wallace & Tiernan low pressure gage

sector by a spring and to a sheave on the pointer shaft. As the shaft rotates, the filament turning on the sheave, maintains a uniform tension between the moving parts. The pointer is pivoted in bearings and balanced to minimize position error.

A precision dial manometer, likewise displayed, is suitable for use with such aircraft instruments as air speed, manifold pressure, and fuel pressure indicators. Principal application expected is in gas turbine testing and in dynamometer and thrust stands for power plant testing. Either pressure or vacuum can be measured up to 200 inches of mercury.

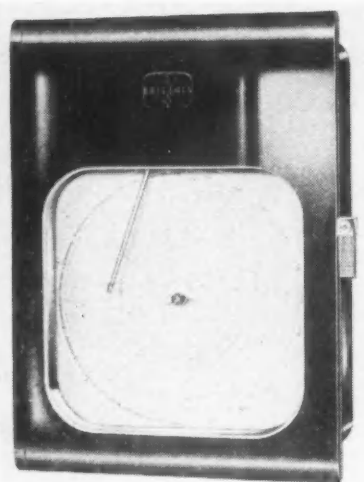
IS-11—Handwheel Strainer



Duplex strainer on display by the R-S Products Corp., Phila., Pa., consists of a single handwheel strainer for supplying clean water for industrial, processing and utility purposes. Valve mechanism is claimed not subject to erosion.

IS-12—Recording Instruments

A new line of recording thermometers and recording gages known as the Series 500 line is being shown by The Bristol Co., Waterbury, Conn. The case is designed for mounting



Bristol recording thermometer

either on a wall, front of panel, or flush on a panel, and can be easily converted from one type of mounting to another.

Pen arms are pivoted on stainless steel journals with the pen arm shaft supported at both ends in a rigid one-piece mounting. The journals are ground and polished to provide low-friction action. Series 500 recording thermometers and gages are furnished in 8-in. and 12-in. sizes in a variety of ranges.

IS-13—Surface Tension Balance

A surface tension balance manufactured by Roller-Smith, Division of Realty & Industrial Corp., Bethlehem, Pa., measures surface tension of liquids by means of a double scale. One scale reads in milli-grams and



Double-scaled surface tension balance manufactured by Roller-Smith

NEW PRODUCTS

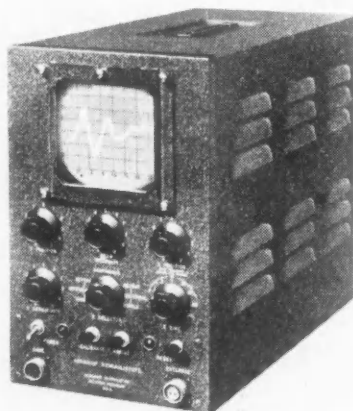
AT THE INSTRUMENT SHOW

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the other directly in dynes per centimeter.

This balance, one of many instruments exhibited, comes completely equipped with the necessary platinum ring, watch glasses, check weights, etc. The instrument has a glass cover which shields the hook, ring, liquid and stage. A stage is provided for carrying the sample in a watch glass, the stage being raised and lowered by a rack and pinion operated by a knurled knob projecting from the front of the case.

IS-14—Electronic Analyzer



Aeroquip Hydraulicscope—high speed electronic analyzer

A high speed electronic analyzer for pressure phenomena, called the Hydraulicscope, giving consistent results even when used by persons unfamiliar with electronic devices, is on display by Aeroquip Corp., Jackson, Mich. It is compact and portable, all of the elements required to transform pressure impulses at the pickup into indications on a cathode-ray tube being integral.

Designed to indicate and record pressures of only a fraction of a second duration when applied to aircraft hydraulic systems connected

with flexible hose, the new device in test showed that momentary peaks and surges of sufficient pressure were occurring to rupture the hose, the surges being undiscernible by inertia-inherent conventional means of hydraulic circuit analysis.

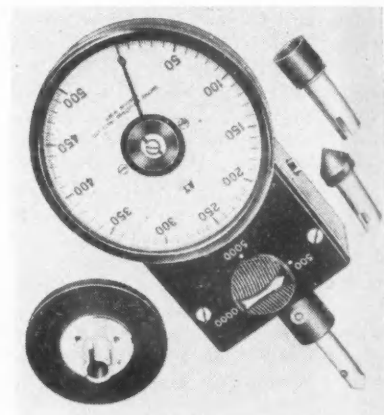
Basis for operation of the new unit is the well known Wheatstone bridge circuit.

IS-15—Hand Tachometer

A new and highly accurate hand tachometer has been by Smiths Industrial Instruments Ltd., for which Equipoise Controls, Inc., Mount Vernon, N. Y., is exclusive national distributor.

Transmission of the driving spindle rotation to the indicating pointer is effected in the first stage mechanically and in the second stage magnetically. Speed changes are indicated instantaneously.

A novel rocker-arm arrangement effects the instrument pointer to al-



Hand tachometer distributed by Equipoise Controls, Inc.

ways read in the same direction irrespective of the direction of rotation of the instrument spindle—that is, clockwise or counter-clockwise.

The instrument pointer shaft is carried between two jewel bearings thereby increasing sensitivity by reducing friction to a minimum. A push-button device analogous to that of a stop watch, enables the operator to arrest the indicating pointer.

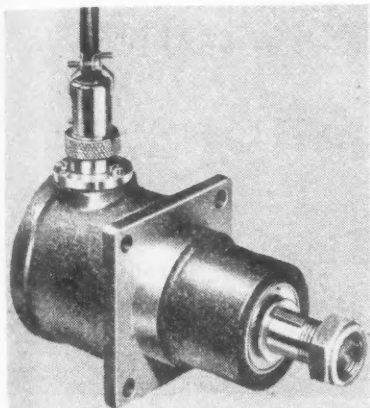
Each of three models has three ranges, selected by turning the arrow on the knurled knob to the range marked on the instrument. Model ATH4 has a maximum range of 0 to 50,000 rpm or 0 to 25,000 rpm.

Accuracy is guaranteed within plus or minus 0.5 per cent, maintained over a wide range of ambient temperature variation by means of an ambient temperature compensating device built into the instrument.

IS-16—Electric Tachometer

A completely new, small-size, low cost electric tachometer (illustrated), designed for continuous operation, and just announced by the Electric Tachometer Corp., Phila., Pa., is being exhibited at the National Instrument Conference.

Measuring only 2 3/4 in. by 5 1/2 in. this unit is said to broaden the field



Electric tachometer for continuous operation

for providing indications of speed and production at all points of the scale. Housed in a cast bronze case, the new tachometer operates in any position and is claimed to be substantially free from effects of stray-magnetic fields.

Various shaft arrangements are available to meet a wide variety of operating conditions, including many of the most difficult from an engineering point of view. A suitable assortment of indicating meters is available.

Due to construction and special features essential in a magneto designed for continuous duty, the M-1200 is heavier than the laboratory type used for light service and intermittent duty, but both smaller and lighter than the standard heavy-duty type, making it adaptable to many applications where size and weight preclude use of a larger unit.

Additionally, on display, is a new speed and production recorder, gear driven, and electrically operated, which may be installed at the machine or in a remote location.

IS-17—Two New Manometers

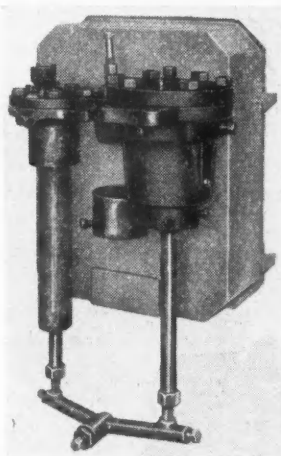
Two new items displayed at the ISA Show by Taylor Instrument Companies, Rochester, N. Y., are a mercury manometer and a new stainless steel aneroid manometer.

The mercury manometer (illustrated) for indicating, recording, and controlling flow, liquid level, and differential pressures, features a large diameter float and a long travel with

NEW PRODUCTS AT THE INSTRUMENT SHOW

For additional information regarding any of these items, please use coupon on page 58

high available energy for positive pen positioning. An interchangeable range chamber feature adapts it to standard ranges of 10, 20, 50, 100, 200, and 400 inches, with continuous ranges from 10 in. to 533 in. of water without piping changes. Two ma-

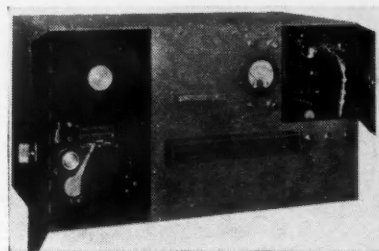


Taylor mercury manometer

nometers can be mounted on back of a single case for recording two flows or for ratio-flow control.

The stainless steel aneroid manometer (not illustrated) measures and controls flow, liquid level, or specific gravity of applications involving caustics or difficult acids such as sulphuric, acetic, nitric, and phosphoric. Because corrosive fluids can be introduced directly into the manometer, no sealing fluids or purges are necessary. Balancing agent is a torque tube to eliminate any need for liquid.

Elimination of mercury prevents product contamination from this source and in this model is said to constitute a definite process economy. Maintenance is cut to a minimum because there is no mercury to replace; no stuffing box, no internal parts to wear out. Stainless steel manometers are available in ranges of 20, 50, 100, and 200 in. of water differential with a body pressure rating of 300 psi.



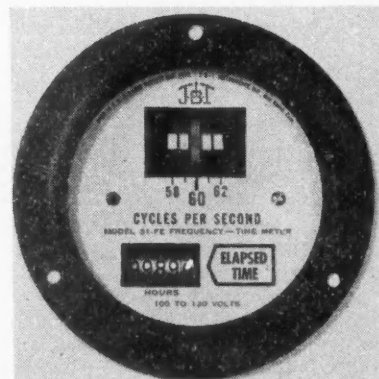
Century oscillograph No. 0-45-2

C-19—Oscillograph

Adaptable by aircraft and automotive manufacturers in the study of vibration problems are the oscillograph and the galvanometers offered by the Century Geophysical Corp., Tulsa, Oklahoma. The oscillograph illustrated, No. 0-45-2, is available for 12, 14, 24, 28 or 50 trace operation at a wide range of continuously variable, governed paper speeds, producing records of high electrical fidelity and photographic quality.

A temperature compensated timing fork controls the frequency of the oscillator-amplifier to within five parts in one million per degree C. A self-contained voltage regulated power supply insures accuracy independent of supply battery voltage. The magazine assembly handles paper widths from 2 in. to 8 in. in 200 ft lengths.

C-19—Frequency Meter



J-B-T combination frequency and elapsed time meter

A combination frequency and elapsed time meter is among many instruments on show at Philadelphia, September 13 to 17, manufactured by J-B-T Instruments, Inc., New Haven, Conn. The model 31-FE combines the elapsed time meter or running time meter with frequency reeds, reading 9,999.9 hours, 58-62 cycles per second at 100 to 130 volts. This 3 1/4 in. meter is especially useful on motor generator sets and on electrical equipment where maintenance routine calls for periodic servicing.

(Turn to page 62 please)



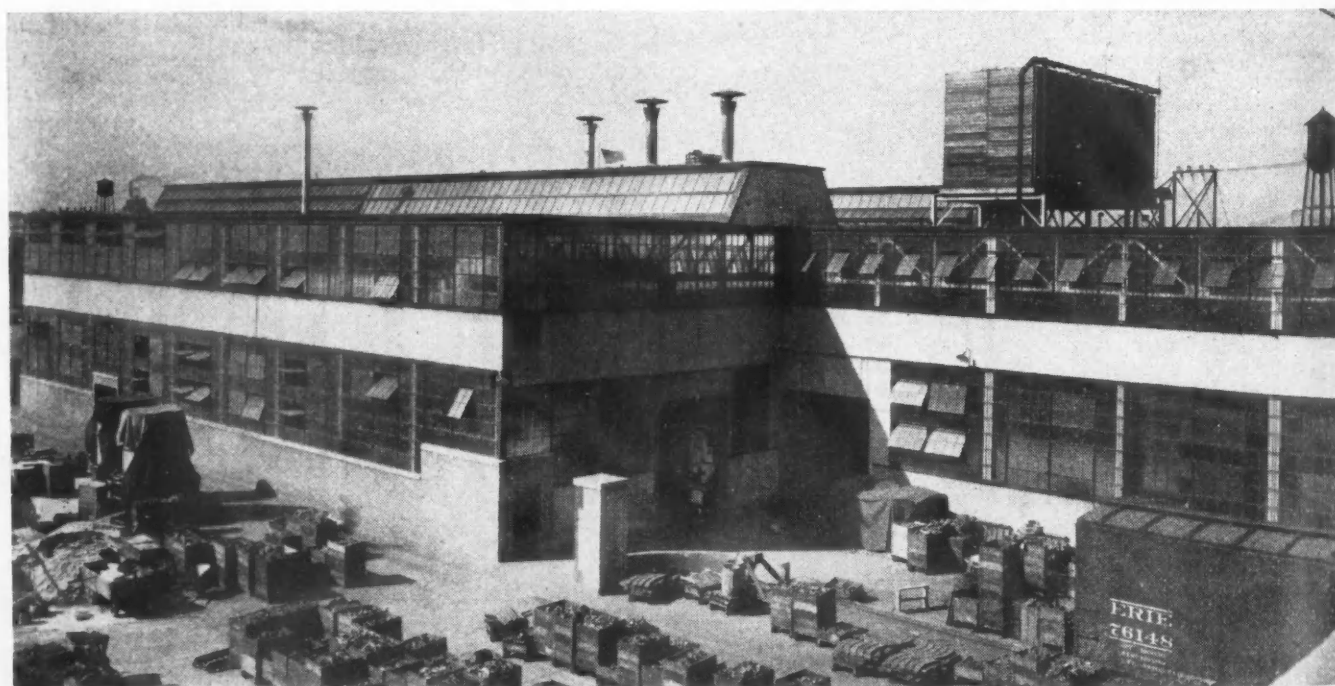
With a steadily increasing volume of work, the wartime plant became inadequate. This photo shows the new framework being built over the 1942 building.

Unique Method of Plant Expansion

CATERPILLAR Tractor Co. East Peoria, Ill., took over several old factory buildings about 40 years ago to set up its heat treating department. The company's expanding business was squeezed into the old buildings until 1942, when the demands of the Armed Forces for tanks and earth-moving equipment made it imperative that facilities be enlarged at once. As it was impossible to shut down the plant for rebuilding at that time, a new and larger building was built over the existing structure—walls and roof—then a floor was laid around the heavy machinery inside the plant, and finally the old buildings were torn down inside the newly erected walls. The remodeling was done without stoppage of production.

Several years ago it became apparent that still larger facilities were needed. Again the demands of industry made it necessary that there be no break in production, so engineers of Caterpillar decided to repeat the wartime performance. The heat treating department was housed in two adjoining buildings. Work was begun toward erecting a new structure over the two existing buildings, beginning with the steel frames for walls and roof, and then completing the masonry and roof to enclose the still-standing buildings. The two buildings-within-a-building were then carefully torn down, so that the heat treating department was newly housed without moving. The new structure has just been completed.

Present building, swallowing the 1942 structure.

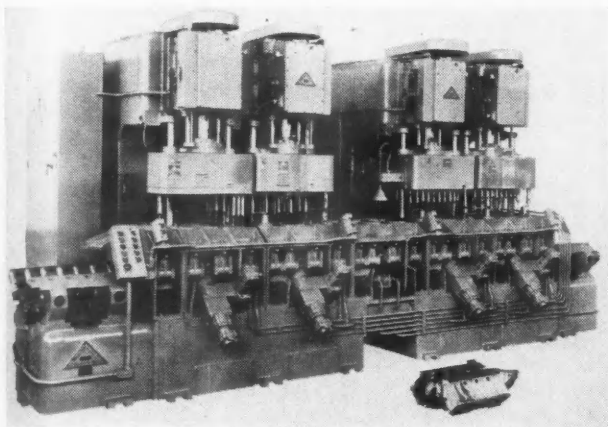


M-42—Cylinder Block Process Machine

A 7 station line process machine to drill, ream, chamfer and counterbore bottom faces of cylinder blocks has been produced by the LeMaire Tool & Mfg. Co., Dearborn, Mich., for a leading manufacturer of V-8 motor cars.

These operations are performed: at sta. 1—load; sta. 2—drill 9 holes (2 locating holes drilled and reamed); sta. 3—drill 16 holes, chamfer 1 hole; sta. 4—idle; sta. 5—drill 27 holes; sta. 6—counterbore 10 holes—ream 1 hole; sta. 7—unload. Production is approximately 72 pieces per hour at 100 per cent efficiency.

The machine consists of two main center base sections of welded construction to support two columns, the work holding fixtures and index mechanism. Each column supports



LeMaire 7-station line process machine for operations on cylinder blocks.

two LeMaire No. 5000 twin ram self-contained hydraulic drill units with multiple spindle drill heads, which move on hardened and ground guide bars. Two end bases support the loading and unloading mechanism. A bridge type support carries the fixture at idle station No. 4. All drill guide bushings are mounted in the fixture. Transferring of the work, location and clamping is hydraulically operated. Solenoids are mounted on a control panel. Transferring of the cylinder blocks is by means of a transfer bar with latch type fingers that retract on the bar's return stroke.

Location for the first operating station is by a wedge type locator entering a cored opening in the side of the block. At this station two locating holes are drilled and reamed which are used as final locating points on subsequent operations. Rough location at stations 3, 5, 6 is made by locators entering the same cored opening with final location on two reamed locating pins. As the work is carried from station to station, it rides on spring mounted guide blocks that keep it snug against hardened guide bars. After final location the block is locked up against the guide bars.

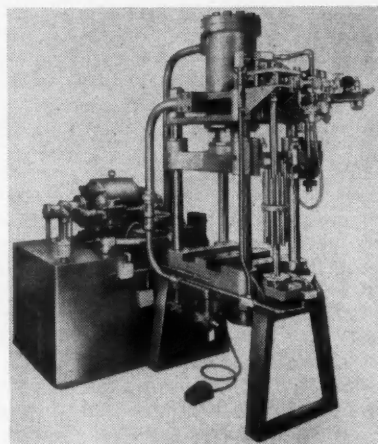


For additional information regarding any of these items, please use coupon on page 58

The entire cycle, including transfer, rough locate, final locate, clamp, drilling cycle of head, unclamp, and withdrawal of locators is automatically performed after the block has been put in the loading station and

sequences, this new press allows any number of sequences up to the maximum of twelve, with adjustable bending depth and automatic reset. There is a choice of four bending radii.

The press bed has two cushions. In line with each cushion are two



Elmes hydraulic tube-bending press

bending noses, each having a different radius. An entirely new indexing device, said to be a major improvement in bending-press operation, controls the sequence and depth of bends. Foot treadle control operates the press cycle, leaving operator's hands free.

Different bending combinations can be set up quickly and easily on this flexible press, it is said, making it feasible for experimental as well as for production runs. Uniformity of work is claimed at any production speed, because all bends are controlled mechanically. Press capacity is 20 tons.

M-44—Combination Lift Truck, Crane

A new power industrial truck combining a low lift platform and a crane is offered by Elwell-Parker Electric Co., Cleveland, Ohio. This combination is effective for many load-handling operations in manufacturing, warehousing and shipping.

The crane can pick up a load from floor level and lift it to hook height



Elwell-Parker lift truck and crane

M-43—Tube-Bending Hydraulic Press

Forty-eight possible bending variations for forming exhaust pipes, frames, and similar products on a mass production basis are offered by a new hydraulic tube-bending press developed by Elmes Engineering Works, of American Steel Foundries, Chicago. Unlike previous 12-position presses that actually could be set up for only 6 different bending

of 8 ft within a radius of 45 deg either left or right from base. Its shape and mechanism provide means for reaching, high-stacking or taking down raw materials or finished products in such form or package as may be handled with rope or cable slings.

The truck's platform can lift and transport loads weighing 3 to 5 tons, depending on the size and model. Loads may be piled directly on the truck's platform or on skids under which the platform can maneuver after loading.

Crane and platform are operated independently of each other, so that the crane may be used by itself at any point any length of time. The boom is of box girder construction, 8 ft long.

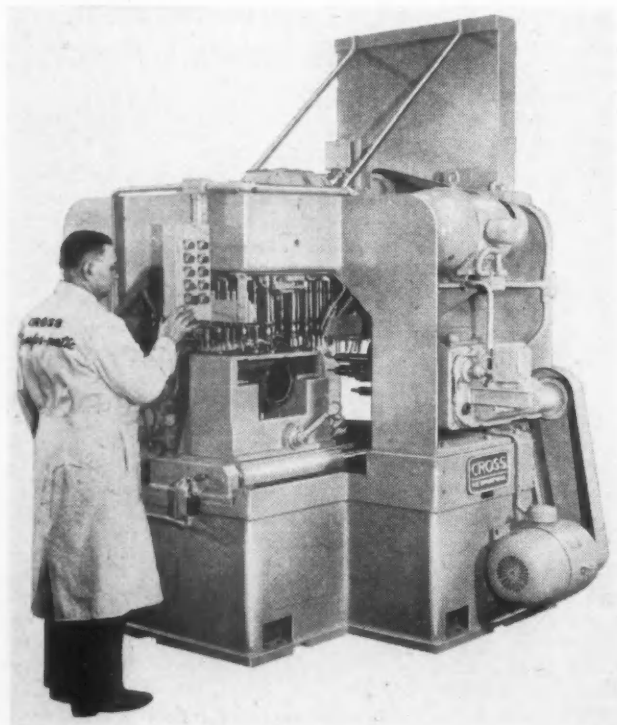
The truck body remains stationary while the operator moves the boom left or right. A manually controlled brake on the crane column enables the operator to lock the boom in any over-side or central position to avoid swing of load when the truck is working on uneven floors.

The crane's load-lifting capacities range from 1000 to 2000 lb.

M-45—Special Transmission Machine

Example of what a special machine tool can contribute to manufacturing operations requiring only moderate production, has been demonstrated by the Cross Co., Detroit, Mich., with this new machine which taps 60 holes in an automatic transmission case at the rate of 65 pieces hourly.

The work cycle is automatic and push-button controlled. When the button is pressed, 25 holes are tapped



Cross special machine taps holes in automatic transmission cases

NEW Production and Plant EQUIPMENT

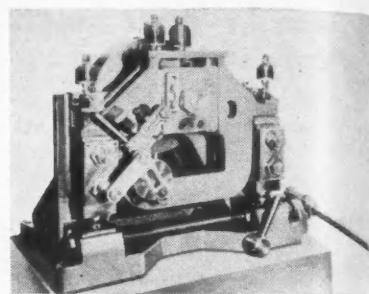
For additional information regarding any of these items, please use coupon on page 58

at station one. An automatic shuttle then carries the part to station two, where 35 more holes are tapped, after which the part is returned for unloading.

Each tapping spindle is equipped with an individual lead screw feed, having a safety device to eliminate tap breakage if holes have not been drilled in the previous operation, and with a lubricating system which provides a measured amount of oil with every cycle.

M-46—High Speed Blanking Press

Ferracute Machine Co., Bridgeton, N. J. has added to their line a No. 0 small high speed blanking press of 3 ton capacity. It has a standard $\frac{3}{8}$ in. stroke, and handles material of approximately $\frac{1}{2}$ in. maximum width, and 1 in. maximum feed for blanking parts at a maximum width of $\frac{3}{8}$ in. and a maximum length of



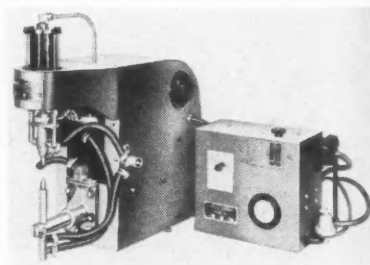
Ferracute blanking press of 3 ton capacity

$\frac{7}{8}$ in. The press is built to utilize a 1 hp electric motor at 1800 rpm, and uses only 20 by 30 in. of floor space. Overall height is 26 $\frac{1}{2}$ in.

The shaft has a diameter of $\frac{3}{4}$ in. and 1 $\frac{1}{4}$ in., and a length of 7 $\frac{1}{4}$ in. at the main bearings. At the crank pin, the shaft is 2 $\frac{1}{2}$ in. in dia and 2 $\frac{3}{8}$ in. long. The crosshead area of the machine from front to back is 3 in., and from right to left, 4 $\frac{1}{4}$ in. The hole for the punch shank has a diameter of 1 in. and is 1 $\frac{1}{2}$ in. in depth. Area of the die bed is 3 in. from front to back, and 8 in. from right to left, with an opening of 1 by 2 in., a shut height of 4 $\frac{3}{4}$ in., and an adjustment upwards of $\frac{1}{2}$ in. The flywheel has a diameter of 14 in. and a face of 3 $\frac{1}{2}$ in. It weighs 125 lb and turns at 1750 rpm.

M-47—Bench Type Spot Welder

For joining small metal parts, Weldex Inc., Detroit, Mich., has introduced a new, fully automatic 7 $\frac{1}{2}$ KVA bench type spotwelder, Model 752-PB. Engineered to handle light non-ferrous metals of the same or dissimilar alloy and thickness on a high speed production basis, it is also claimed to give low-cost operation



Weldex bench type spotwelder

on ferrous metals up to two thicknesses of 14 gage CRS or equivalent.

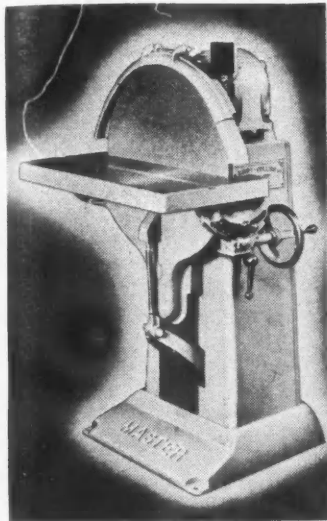
In addition to air strainer, regulator, gage and lubricator, standard equipment includes a built in four-step transformer tap changing switch; single acting air cylinder; magnetic contactor; and electronic timer. Regularly, furnished for 220

volt, 60 cycle, single phase A.C. operation, this model is likewise available in 380 or 440 volts. Standard throat depth is 4½ in.

Complete with separate control cabinet the whole unit occupies less than two square feet of bench space.

M-48—Vibrationless Disk Grinder

The Kindt-Collins Co., Cleveland, Ohio, announces a new 24 in. disk grinder of advanced design for the



24-inch Kindt-Collins grinder

efficient sanding or grinding of wood, metal and plastics.

The new grinder is made vibrationless through perfect balancing which permits extreme grinding accuracy. It is adjusted by means of a counter-balanced table, which can be moved up or down 11 in. by hand pressure. A feature is the reversible disk for right or left hand jobs. A 5 in. hole in the back of the machine permits attaching to a dust collector. Dust collectors specifically designed for use with this master grinder are available.

M-49—Lightweight Handy Hoister

Lewis-Shepard Products Inc., Watertown, Mass., presents the new CH handy hoister, a light-weight, stacker designed for lifting, lowering, and transporting tools and raw materials.

Crank-up-crank-down operation through planetary gear drive winch permits placing and holding the platform at any level. Winch handle cannot spin or get away from the operator when lowering the load, and is designed to swing out of the way when not in use. One revolution of the winch handle gives full 3 in. lift.

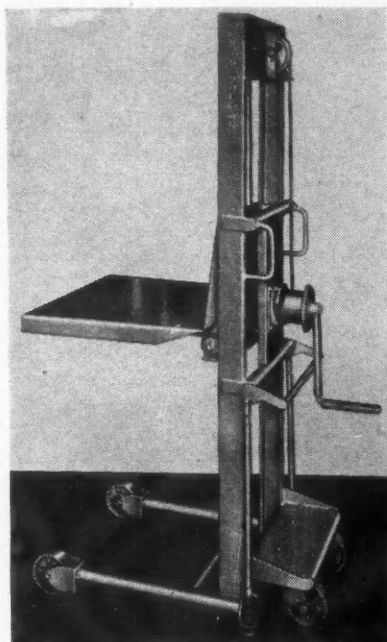
Base, of open-end type, straddles



For additional information regarding any of these items, please use coupon on page 58

machines or other obstacles. Arc-welded tubular base members are used to resist twisting of frame work. Similar tubular bracing prevents weaving of upright members.

Two floor locks, one at each side



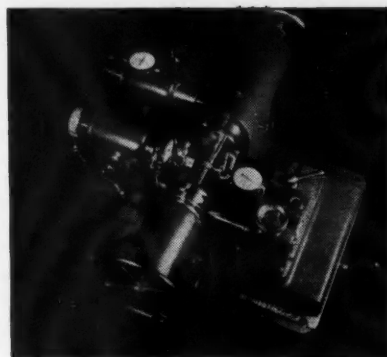
Lewis-Shepard handy hoister

of the upright members are operated by a single handle at convenient height, and hold the handy hoister firmly in position when loads are being raised, lowered, or moved on and off the carriage.

The CH handy hoister is stocked in a standard size of 500 lb capacity, having 24 in. by 24 in. lifting platform; 5½ in. lowered height; 58 in. lifting height; 71 in. overall height and 5 in. dia wheels at front and rear, either steel, rubber tired, or moulded plastic.

M-50—Universal Gear Checker

A new small Red Wing universal gear checker brought out by National Broach & Machine Co., Detroit, Mich.,

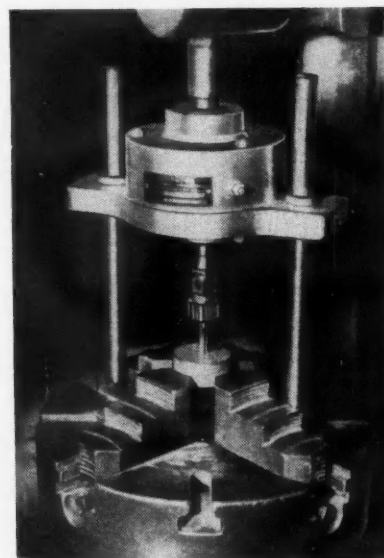


Red Wing universal gear checker

more compact than its predecessors, handles gears up to 10 in. OD; checks lead eccentricity, and both tooth spacing and tooth parallelism. Obtainable with or without the base, it is desirable in the shop alongside gear cutting and finishing machines to reveal errors before too much scrap has been produced. Overall dimensions are 18 in. wide and 29 in. long.

M-51—Turret Lathe Tapping Head

A new turret lathe tapping head which permits tapping a hole and backing out the tap without stopping the work or reversing the machine in a turret lathe set up, is offered by Errington Mechanical Laboratory, Inc., Staten Island, N. Y. With the aid of a friction chuck blind holes may be tapped, also, without any possibility of tap breakage, it is said.

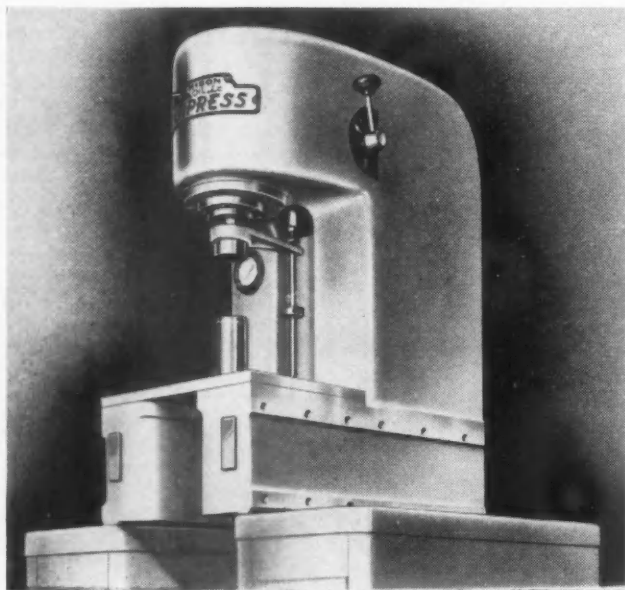


Errington turret lathe tapping head

This Errington Auto-Reverse turret lathe tapping head likewise can be used on drill press work for production-tapping. For this work the head has a 2 to 1 reverse, and uses guide-bars to hold and steady the case.

M-52—High-Speed Multipress

A new Rocket Multipress of 4-ton capacity, manufactured by the Denison Engineering Co., Columbus, Ohio, is said to offer speeds three times faster than standard Multipress models while retaining all the advantages of oil-smooth HydroILic power. Three major design changes, one in the control system, one in the operating component and one in the power system, result in the new high-speeds of 1100 ipm approach speed, 450 ipm pressing speed and 750 ipm return speed. These new high speeds are said to be achieved without sac-



Denison Rocket Multipress of 4-ton capacity

rificing either tonnage or operating characteristics of the standard models.

This new Rocket Multipress is especially suited to high-speed applications and jobs where hydraulic equipment was formerly thought to be too slow.

M-53—Die Casting Machine

A larger, hydraulic model of the Workhorse fully automatic die casting machine is introduced by Light Metal Machinery, Inc., Cleveland, Ohio. It is designated No. 32 HZ and designed for zinc, tin or lead production. Shot capacity is 32 oz, or twice that of smaller Model 16 AZ, which is air operated.

Top speed of the new machine is 720 shots per hour. Other speeds are 520, 340, 240. Casting cycle is completely automatic. Die movement, shot and ejection follow smoothly in continuously repetitive cycles. Once the operator sets the machine's speed, he merely fills the melting pot occasionally and lubricates the die.



For additional information regarding any of these items, please use coupon on page 58

M-54—Deep Throat Press

A new 15-ton Rousselle deep throat press No. 2-G, has been added to the regular line of open back inclinable and adjustable bed horn punch presses manufactured by the Service Machine Co., Chicago.

Entirely new, this press features an 18 in. throat which permits working to the center of 36 in. sheets, fitting it for sheet metal shops and for work ordinarily receiving larger, slower presses.

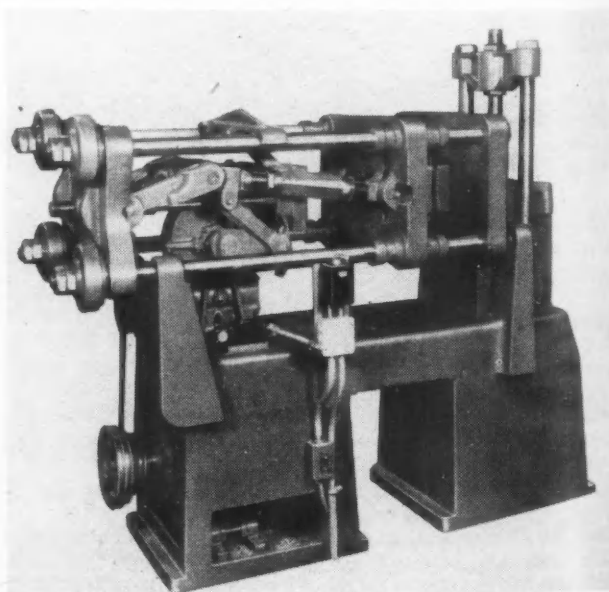
The bolster plate measures 11 in. by 16 in. and the shut die height is 7 3/4 in. to the bed. This press has a standard 2 in. stroke.



Rousselle deep throat press No. 2-G

The press is equipped with a single stroke or continuous clutch, roller bearing flywheel, large air-cooled brake and hinged motor mount. It operates at 200 rpm with a 1 hp 1750 motor. Weight complete is 1875 lbs.

Model 32 HZ die casting machine of the Light Metal Machinery Co.



P-47—Aluminum Alloy Truck Flooring

Brown Industries, Spokane, Wash., are offering a new aluminum alloy, "Coralite", to be used for truck flooring. "Coralite" is .091 inches thick, corrugated three-quarters of an inch in depth, and fabricated without seams.

Developed to reduce weight in construction of trailers and bodies, it is claimed durable, splinter-proof and moisture proof. "Coralite" cleans perfectly and can be sterilized for handling perishable cargoes. Seamless, its continuous metal membrane turns up on each side of the van or



For additional information regarding any of these items, please use coupon on page 58



Truck flooring of "Coralite," a light aluminum alloy manufactured by Brown Industries

trailer to any height to afford a perfect seal to the aluminum lining. Milk, cream, fish and meat may be interchangeable as cargo, where "Coralite" is used for flooring, it is claimed. Washing and steam cleaning are said to remove all taints from body interiors.

The corrugation provides a drainage for all loads which must be kept dry and clean, providing likewise continuous circulation of air beneath refrigerated loads. The flooring is comparable to a solid one-half inch of aluminum plate in rigidity, but weighs only 25½ per cent of such material, according to the manufacturer.

The flooring has a theoretical uniform load-carrying capacity of 36,000,000 lb in a 35 ft trailer. It is not slippery.

P-48—Two-Tone Plated Ornament

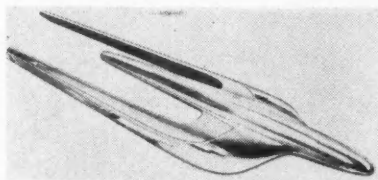
Mass production of a hood ornament for a 1949 automobile having both gold and chrome plating on a single piece of die cast metal, is announced by the F. L. Jacobs Co., Detroit, Mich.

This method of two tone plating was developed by Continental Die Casting Corp., a division of the Jacobs firm. The secret was in finding a suitable masking material to cover

the area to be gold plated, while the rest of the ornament was to be chrome plated.

The hood ornament is a single piece zinc alloy die casting, 20 inches long weighing 3¾ lb. About one-fourth of the top surface is gold plated, while the remaining three-fourths is chrome plated.

In the Continental process, the casting is first given a copper bath for hardening, then a nickel bath for corrosion resistance. The masking material, a copper-nickel metal



Gold and chrome plated hood ornament

covered by a plastic coating, is then bridged across the area to be gold plated. With this masking material held securely in place by wire, the casting is chrome plated. The mask is next removed, and the casting goes to a gold plating bath. The gold plated area is then sprayed with a coating of enamel, and baked for an hour to provide a protective coating for the gold.

P-49—Metal-to-Metal Bonding Film

An unsupported film of pure adhesive that provides a metal-to-metal bond resistant to shear tests up to 3,500 lb per sq in. has been produced by the Minnesota Mining &



Minnesota "Scotch-Weld" bonding film

Manufacturing Co., St. Paul, Minn.

Called "Scotch-Weld" bonding film, it is transparent, roughly resembles cellophane, is provided in rolls like tape, is not tacky to the touch, yet is 100 per cent adhesive with no supporting material in the film.

The film is placed between units to be bonded and is cured by simultaneous application of heat and pressure—a heat of 300-to-500 F for 5-to-60 minutes, and a pressure of 25-to-100 lb per sq in., both varying with type of bond desired. Tests reveal shear strengths to 3,500 lb per sq in. in bonding .064 in. aluminum Alclad to itself.

In bonding the same metal to fibre, wood and plastic surfaces, the non-metallic materials are reported to have delaminated at 880, 1,770 and 2,800 lbs per sq in. respectively. The adhesive did not fail.

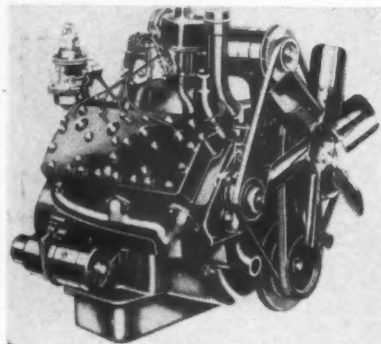
Qualities listed are high bonding strength to a wide variety of materials, ease of application, simplicity of production line use, long life on the roll, assurance of adhesion over the entire surface with no "starved" areas, and inertness in water, oils and most solvents. Preparation requires only conventional cleaning.

P-50—Heavy Duty Air Hose

The development of Condor Homoflex heavy duty air hose for rugged air service requiring a super-tough type of hose has been announced by Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J. According to the manufacturer, it has a strong tube compounded of Manhattan oil-proof Flexlastics, two braids of heavy strength member, and a thick abrasive resistant oil-proof Flexlastics cover. Two sizes, ¾ in. and 1 in. inside dia, are being made with working pressures of 350 and 300 lbs.

P-51—Five Ford Power Plants

The Ford Motor Co., Dearborn, Mich., is in production with five new power plants for the industrial engine field, particularly adapted for



Ford industrial engine.

such equipment as cranes, shovels, pavers, pumps, compressors, winches, hoists, etc. The new Ford industrial engine models are the 337 and 239 V-8's; the 254 and 226 six-cylinder, and the 120 four-cylinder, the numeral indicating cubic inch piston displacement.

The 337 V-8 bore and stroke is $3\frac{1}{2}$ in. by $4\frac{3}{8}$ in. and compression ratio, 6.5 to 1. It develops 258 ft-lb torque and has proportionate high hp output. Exhaust valves are hard faced chrome alloy steel. Valve seats are molybdenum chrome alloy. Intake valves are chrome nickel alloy for heavy duty service. The heavy forged steel crankshaft has integral counterweights and hardened steel journals. Replaceable precision type steel backed triple layer copper lead alloy bearings are used. The pistons have four rings above the pin with the top compression ring chrome plated to resist cylinder bore wear.

The 254 six-cylinder engine bore and stroke is $3\frac{1}{2}$ in. by 4.4 in. and compression ratio 6.7 to 1. It develops 211 ft-lb torque. Hard faced chrome cobalt exhaust valves, chrome rings and triple layer copper lead alloy bearings are standard equipment.

The 239 V-8 engine has bore and stroke of $3\frac{3}{16}$ in. by $3\frac{3}{4}$ in., compression ratio 6.8 to 1, developing 187 ft-lb torque and comparable hp.

The bore and stroke of the 226 six-cylinder engine is 3.3 in. by 4.4 in. and compression ratio 6.7 to 1. Maximum torque is 183 ft-lb. The crankshaft is of Ford alloy steel. Triple layer copper alloy bearings are steel backed.

The Ford 120 four-cylinder engine has a 6.5 to 1 compression ratio and $3\frac{3}{16}$ in. by $3\frac{3}{4}$ in. bore and stroke. Cylinder sleeves are removable dry liners. The crankshaft is of Ford alloy steel, statically and dynamically balanced. A variable speed, mechanical governor is gear driven. It



For additional information regarding any of these items, please use coupon on page 58

develops a maximum of 84 ft-lb torque.

All Ford industrial engines have series flow cooling, assuring more uniform water temperatures. All engines are available with SAE housings so that standard heavy duty clutches and power takeoffs can be used. Three, four and five speed heavy duty transmissions are also available.

P-52—Wing-Nut Filter Element

From the engineering laboratories of Purolator Products, Inc., Newark, N. J., comes a new oil filter known as the Wing-Nut type, which greatly eases filter element checking and changing. Checking the filter element is now said to be as easy as checking the oil. Without using a tool of any kind or disconnecting a single oil line the wing nut is unscrewed and the cover lifted off, bringing the dirty element with it.

If the element requires replacement, a light tap on the side of a waste can dislodge the element, the new clean element is quickly installed, the unit is inserted back into the filter case, and the wing



Purolator wing nut filter element

nut is tightened. The job is performed in a few minutes. The dirty element need never be touched.

The wing nut filter includes the Micronic element, for insuring a fine degree of filtration. Plastic impregnated cellulose forms the basic filtering material insuring uniform filtration.

By means of the special accordion-pleated design the filtering area is greatly increased and provides 490 in. of filtering surface. Oil flow is from the outside in.

P-53—Device Measures Thickness



Photocon ultrasonic measuring device.

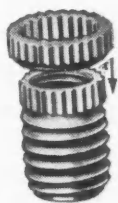
An ultrasonic device known as the Metroscope that automatically measures the wall thickness of metal, plastic and glass parts where only one surface is accessible, and also makes rapid, non-destructive tests to detect flaws and imperfections in these materials, is now in production and ready for delivery by Photocon Research Products, Pasadena, Calif. The device is said to measure the wall thickness of a long tube, for instance, with less than 2 percent error, and in testing for flaws it detects thin voids and cracks that do not appear by X-ray.

The Metroscope employs an electronic oscillator to generate electrical voltage, the frequency of which is varied throughout the tuning range of the oscillator. The point or points in this tuning range at which the part resonates are indicated. Thickness of tubes and flat parts between 0.015 and 0.300 in. may be read directly, and up to several inches may be read indirectly. The resonance indications also give information about flaws in solid parts. Steel, brass, nickel, copper, silver, aluminum, magnesium and lead, as well as glass and plastic, may be measured and tested. The Metroscope is finding use on rocket motors, aircraft propellers, etc.

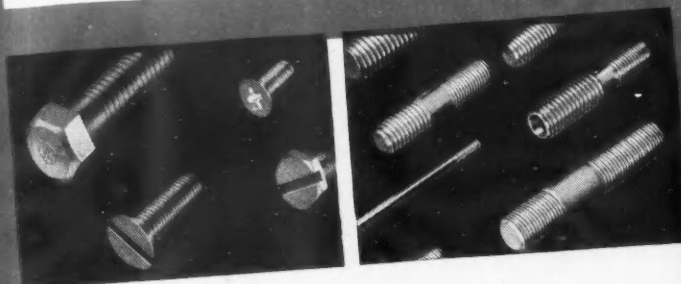
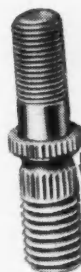
SPECIALTY FASTENERS

to fit unusual fastening jobs

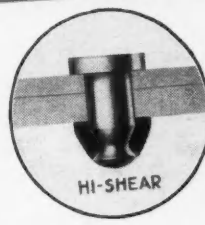
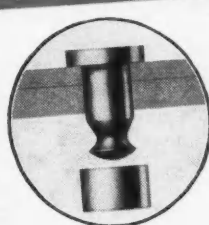
If your fastening job requires a difficult or unusual method of fastening, it is very likely that "National Screw" has a specialty fastener to fit your requirements. Here are three of the many "National" Specialties that have proved successful.



"ROSÁN"* INSERTS** give the strength of a steel tapped hole to soft metals, plastics or wood. A serrated ring locks the insert to the parent material so that it can't loosen, turn or pull out under tension or torque. **ROSÁN STUDS** can't loosen or turn—even under vibration.



"LOK-THRED"* fasteners hold securely in place.** This new thread design for studs, bolts and screws is the only thread that of itself holds tight. Actually, it becomes *tighter* in service, even under vibration. Stronger in both tension and torsion, "LOK-THRED" forms a seal that liquids under pressure cannot penetrate.



"HI-SHEAR"* RIVETS** reduce weight, increase shear strength. "Hi-Shear" Rivets have a shear strength of 75,000 p.s.i. When used to replace bolts and nuts, they reduce weight and are easier to install. The "Hi-Shear" Rivet consists of a specially formed heat-treated alloy steel pin, headed at one end and grooved at the other. An aluminum collar fits the grooved end and forms a high button head when deformed by a riveting tool. To remove, simply destroy the collar and push out the rivet.



Write for descriptive booklet on any of these specialty fasteners. Please specify which ones interest you.

(*Reg. U.S. Pat. Off.)
(**Pat. Applied For.)

THE NATIONAL SCREW & MFG. COMPANY, CLEVELAND 4, OHIO

Exhibitors at Instrument Show

The latest available list of exhibitors and their booth numbers at the Third National Instrument Conference to be held Sept. 13-17 at Philadelphia (Convention Hall) follows:

Accuracy Scientific Co., 411.
Aeromarine Instrument Co., 516.
Aeroquip Corp., 503.
Aircraft Marine Products, Inc., 232.
American Car & Fdry., Valve Div., 209.
American Institute of Physics, 149.
American Instrument Co., 540.
American Meter Co., 234.
American Society of Mechanical Engineers, 529.
Askania Regulator Co., 427.
Associated Research, Inc., 210.
Autoclave Engrs., Inc., 151.
Automatic Temperature Control Co., 144.
Bacharach Industrial Instrument Co., 510.
Bailey Meter Co., 426.
Baird Associates, Inc., 506.
Ballantine Labs., Inc., 410.
H. Belfield Co., 436.
James G. Biddle Co., 214.
Branson Instruments, Inc., 518.
Bristol Co., 218.
Ralph N. Brodie Co., Inc., 137.
Brooke Engineering Co., Inc., 404.
Brookfield Engineering Labs., Inc., 111.
Brooks Rotameter Co., 142.
Brown Instrument Co., 435.
Brush Development Co., 505.
Buffalo Meter Co., 215.
Builders Providence, Inc., 543.
Burgess Battery Co., 229.
Burling Instrument Co., 550.
Century Geophysical Corp., 133.
Clapp Instrument Co., 542.
C. P. Clare & Co., 102.
Climax Engrg. Co., Controls Div., 302.
Cole Instrument Co., 532.
Conoflow Corp., 249.
Consolidated Engrg. Corp., 226.
Continental Equipment Corp., 217.
Cook Electric Co., 241.
Cramer Company, Inc., 403.
Davis Emergency Equipment Co., 304.
Davison Chemical Corp., 441.
Dehydraise Corp., 247.
Distillation Products, Inc., 527.
Eagle Signal Corp., 530.
Thomas A. Edison Co., Inc., 517.
Electric Tachometer Co., 240.
Electro-Tech Equipment Co., 114.
Energy Control Corp., 438.
Englehard, Inc., 308.
Equipolse Controls, 520.
Esterline Angus Co., Inc., 212.
Fischer & Porter Co., 500.
Fisher Governor Co., 219.
Foster Engrg. Co., 442.
Fredericks Co., 536.
Foxboro Co., 535.
Fulton Syphon Div., Robertshaw Fulton Controls Co., 211.
General Electric Co., 231.
Gotham Instrument Co., 128.
Gow-Mac Instrument Co., 507.
Hagan Corp., 228.
Hammel Dahl Co., 431.
Hays Corp., 447.
Helicoid Gage Div., American Chain & Cable Co., Inc., 448.
Helipot Corp., 135.
Illinois Testing Labs., Inc., 202.
Industrial Instruments, Inc., 421.
Instruments Publishing Co., 147.
International Nickel Co., 131.
J-B-T Instruments, Inc., 204.
Jerguson Gage & Valve Co., 444.
K & K Engrg. Co., 104.
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Kelley Koett Mfg. Co., Instrument Div., 534.
Lawter Chemicals Co., 430.
Leeds & Northrup Co., 246.
Leland Instrument Co., 414.
Leslie Co., 127.
Linde Air Products Co., 526.
Liquidometer Co., 207.
J. E. Lonergan Co., 143.
Macbeth Corp., 309.
Magnetrol, Inc., 445.
Manning, Maxwell & Moore, Inc., 103.
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Meriam Instrument Co., 314.
Milton Roy Co., 112.
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Mine Safety Appliances Co., 119.
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Precision Thermometer & Instrument Co., 303.
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R.C.A. Victor, 531.
Republic Flow Meters Co., 413.
Roller Smith Div., Realty & Industrial Corp., 515.
Rowe Engineering Corp., 320.
R-S Products Corp., 315.
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Sarco Co., Inc., 319.

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South Bend Lathe Works, 432.
Standard Electric Time Co., 312.
Herman H. Sticht Co., 306.
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Superior Tube Co., 206.
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Historical Instrument Exhibit

An exhibit of early instruments has been arranged. This exhibit will be located on the stage and promises to be of exceptional interest.

Small Lightweight Engine

Continued from page 34

bronze alloy and are fitted with oil seals. The connecting rod is made of aluminum alloy of extra large cross section. It is of interest to note that the aluminum alloy of the rod itself serves as the bearing material. The piston is of aluminum alloy, fitted with one double-acting fire ring, a compression ring, and a slotted and grooved oil ring of double wiper type. All rings are hand hammered. The piston pin is of hollow type alloy steel, hardened and ground.

Among the accessories on this engine are: float-type carburetor with idle adjustment; high tension magneto mounted within the flywheel and sealed against spray, moisture, and dust. The spark plug is of 14 mm size. Air cleaners of miniature size, either mesh or oil bath type, are available.

As illustrated, the $\frac{1}{2}$ -gallon capacity fuel tank is of quick removable type and mounted directly to the engine. The oil reservoir has a capacity of one pint.

Special equipment includes a built-in mechanical governor with external adjustment; kick-starter assembly; speed reducer unit with a ratio of 6 to 1; and other items.

The plant is of modern design and has been equipped with small machine tools of advanced type and of familiar makes. The layout has been arranged in rows of machines, each row lined up for the complete

machining of an individual part for straight line processing. For example, the familiar Barnesdril honing machine is set up for honing cylinder barrels; and Heald Bore-Matics are tooled for precision boring of both ends of the connecting rod; and for crankcase boring. Machining facilities and assembly are said to be designed for a maximum output of 500 units per day.

Fiat's New "500"

(Continued from page 35)

French trials are given in the accompanying table.

All cars were production models. The Simca-8 is the 67 cu in. Fiat produced in France. The Citroens were the front wheel drive four cylinder models of 116 cu in. displacement. Every car carried a driver and observer, additional passengers being represented by 176 lbs of ballast per passenger. Standard gasoline was issued, and the distance to be covered was a minimum of 620 miles at an average speed varying from 31 to 37 mph, according to classes. The tests were run on a closed road circuit, including passage through several towns. Competitors were allowed to add dopes to the gasoline, but if this increased the quantity, a corresponding amount of gasoline was withdrawn.



GREYHOUND'S

"HIGHWAY TRAVELER"

is designed to provide

Greater Passenger Safety

through the use of

**VICKERS HYDRAULIC
POWER STEERING**

Vickers Hydraulic Power Steering greatly increases passenger safety in the luxurious, new Greyhound intercity bus, "The Highway Traveler." The new compartment coach seats 50 passengers in three compartments on two levels. With the Vickers Power Hydraulic Booster, the front wheels respond exactly and instantaneously to less physical effort on the steering wheel than is required for a passenger car.

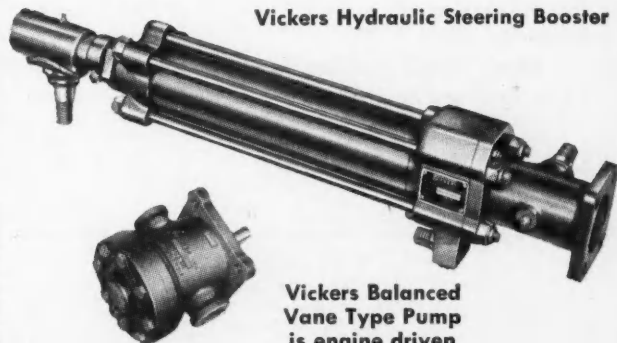
Action of the Vickers Booster not only reduces the driver's steering fatigue, but also contributes greatly to passenger safety. It prevents soft shoulders, ruts, cross winds, road obstructions, blow-outs or sudden stops from disturbing steering action. In event of engine failure or damage to hydraulic system, steering automatically reverts to direct mechanical action.

Brakes are also power hydraulically operated by Vickers equipment.

Veteran driver, Francis Paternoster, who put the new bus through its first tests, says of the Vickers equipment: "That hydraulic steering booster . . . is going to take a lot of the strain out of driving . . . I like these new hydraulic brakes better . . . they're much faster."

Vickers Power Hydraulic Steering is available to handle any front wheel loading on or off the highway . . . can be applied to practically any vehicle with only minor alterations. Write for Bulletin 47-30.

3531



Vickers Hydraulic Steering Booster

Vickers Balanced
Vane Type Pump
is engine driven

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DIVISION OF THE SPERRY CORPORATION

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PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

L-60—Copper Base Casting Alloys

Federated Metals Div., American Smelting & Refining Co.—A new educational manual entitled Copper-Base Casting Alloys has been made available. The illustrated 52-page book covers the practical application of copper-base metallurgy. It also includes a compilation of standard industry specification tables, among which are those of the ASTM, AMS, SAE, Federal Government and U. S. Navy. Subjects covered in the text include thermal effects, shrinkage porosity, gas porosity and various behavior characteristics of high copper alloys, tin bronzes and red bronzes, nickel silver, aluminum bronze, silicon bronze and brass.

L-61—Air-cooled Engines

Wisconsin Motor Corp.—An attractively illustrated 56-page booklet, compiled for those who build Wisconsin Air-Cooled Engines, those who sell and service them and those who use them, contains in simple language the principal facts that have to do with Wisconsin engines. The booklet

is a "behind the scenes" tour showing what goes on in the factory and, later, the many uses to which the engines are put after leaving the factory.

L-62—High Speed Ball Bearing Lubrication

The Texas Co.—The September issue of Lubrication (Texas publication) contains an interesting article on high speed ball bearing lubrication. The article is illustrated with photographs and line drawings, etc.

L-63—Salt Bath Furnaces

Ajax Electric Co., Inc.—Bulletin No. 122 describes the outstanding features of the new Ajax Submerged Electrode Furnace, designed for the salt bath heat treatment of work of unusual length.

L-64—Carbon Manganese Steel

Joseph T. Ryerson & Son, Inc.—A new 4-page bulletin describes Ry-

tense AA, a medium carbon manganese free cutting machinery steel. The bulletin is illustrated and contains figures showing strength, machinability rating, typical analysis, mechanical properties and hardness at various tempering temperatures.

L-65—Clutches

Twin Disc Clutch Co.—The 30th Anniversary Issue of Production Road commemorates the company's founding with an informal survey of power and its transmission through the years. Old turn-of-the-century photographs contrasted with current scenes portray the development of heavy-duty equipment in America.

L-66—Mechanical Finishing

The Sturgis Products Co.—A new 16-page, two color manual illustrates and describes the Roto-Finish Mechanical Deburring and Finishing process. The use of the Roto-Finish method is examined in detail with complete coverage of the four principal procedures which make up the process, deburring and grinding, polishing, britehoning and coloring. The booklet also tells how Roto-Finish operates; the types of parts to which it is best applied; the formulas that govern the mixture of chips and compounds.

L-67—Heavy-Duty Transmissions

Fuller Manufacturing Co. — The
(Turn to page 70 please)

TIME SAVER COUPON for your convenience in obtaining, **WITHOUT OBLIGATION**, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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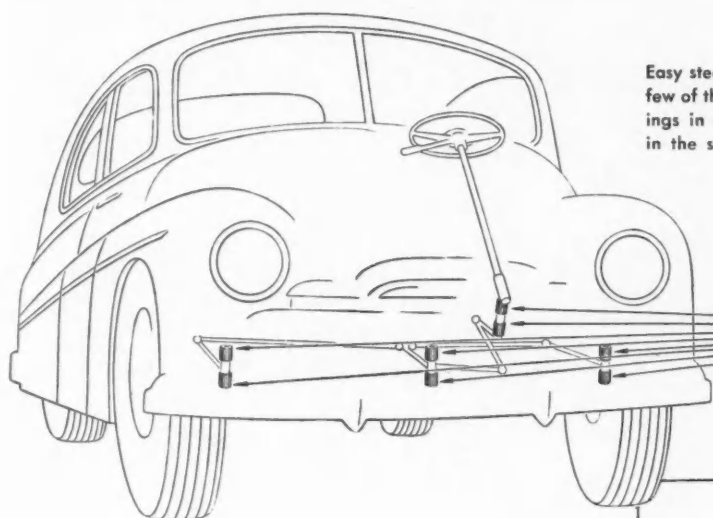
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(Street & No.) (City) (Zone) (State)

Designed for Efficiency

with Torrington Needle Bearings



Easy steering, reduced wear and efficient lubrication are a few of the advantages of the use of Torrington Needle Bearings in steering gear shafts, kingpins and other elements in the steering mechanisms of many new '49 model cars.

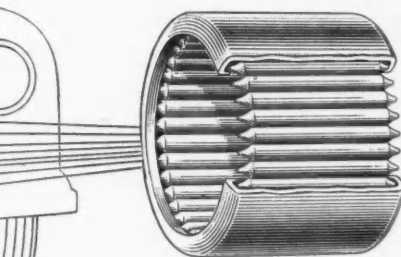
... fabrication and assembly economies are also realized with these low-cost anti-friction units.

SMOOTHER, easier steering is only one of the sales-compelling features built into many new '49 model cars through the use of Torrington Needle Bearings in steering and other front-end mechanisms. The high capacity and efficient lubrication of these modern anti-friction units also mean better all-round service ... longer life ... lower maintenance expense.

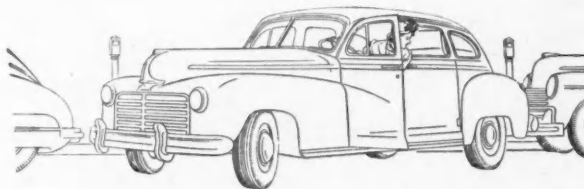
The compact, unit construction of Needle Bearings contributes to greater assembly-line efficiency, too, saving space in design, simplifying component elements, and thus speeding fabrication and installation. Similar advantages are secured by the use of Needle Bearings in automotive equipment, aircraft, farm machinery, machine tools and home appliances.

Torrington's engineers will gladly help you apply Needle Bearings to improve the operation and increase the life of products you build or use. Call or write the nearest Torrington office.

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.
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Cross-section drawing shows how compact Needle Bearings simplify design and provide easier anti-friction operation in steering gear shaft.



Less effort in parking with the new super-cushion tires is especially noted, with better steering always assured by smooth-running Needle Bearings.

TORRINGTON NEEDLE BEARINGS

NEEDLE • SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • BALL • NEEDLE ROLLERS

1948-1949 GERMAN PASSENGER CARS

Tabulated for AUTOMOTIVE INDUSTRIES by Gunther Papenbroock, Hamburg, Germany

GENERAL CHASSIS DATA

ENGINE

Line Numbers	Make and Model	No. of Passengers	Wheelbase (in.)	Tread, Front (in.)	Tread, Rear (in.)	Overall Length (in.)	Overall Width (in.)	Overall Height (in.)	Complete Weight (lbs.)	Tire Size	Max. Speed (MPH)	Model	Location	No. of Cyls.	Arrangement of Cyls.	Bore (in.)	Stroke (in.)	Displacement (cu. in.)	British Taxable HP	Brake Horsepower At Rev. Per Min.	Compression Ratio	Max. Torque Lb.-Ft. at RPM
1.	Daimler-Benz 170 V	5	112	51½	51	169	62½	63½	2480	5.50-16	67	M136	Fr	4	1	2.9	3.94	103.5	13.4	38-3400	9	71 at 1700
2.	Ford Taurus	4	94	45¾	48	161	59½	63	1830	5.00-16	65	Q75A	Fr	4	1	2.5	3.64	71.5	10.0	30-3750	6.6	52 at 2100
3.	Opel (GMC) Olympia	4	95	47	49¼	158	59	62¼	2000	5.00-16	68	1.5 Lit.	Fr	4	1	3.15	2.92	90.7	15.85	37-3500	6	65 at 2000
4.	Opel (GMC) Kapitän	5	106	53½	52¼	182	65½	64½	2600	5.50-16	78	2.5 Lit.	Fr	6	1	3.15	3.23	150.8	23.8	54-3200	6	105 at 1600
5.	Volkswagen 11	4	95	51	49¼	159	60¾	61	1530	5.00-16	63	1.1 Lit.	R	4	0	2.96	2.52	69	74.0	24-3000	5.8	49 at 1900

ENGINE (CONTINUED)

CLUTCH

TRANSMISSION

REAR AXLE

SPRINGS

STEERING

BRAKES

Line Numbers	Cooling System	Crankcase Type	No. of Main Brngs.	Valve Location	Carburetor No. Used and Type	Firing Order	Oil Pressure To	Make	Type	No. of Forward Speeds	Ratio in 1st Gear	Ratio in 2nd Gear	Ratio in 3rd Gear	Ratio in 4th Gear	Make	Drive Through	Gear Ratio	Front	Rear	Make	Type	Turning Diam. (Ft.)	Hand Brake Operates On
1.	W	IN	3	L	1 UP	1-3-4-2	A,B,C,D,E	FS	SP	4	4.03	2.28	1.42	1	DB	RW	4.125	TL	CS	DB	CL	36	RW
2.	W	IN	3	L	1 DO	1-2-4-3	A,B,C,D,E	FO	SP	3	3.07	1.77	1	1	FO	RW	5.5	TL	TL	FO	CL	34	RW
3.	W	IN	4	I	1 DO	1-3-4-2	A,B,C,D,E,F	OP	SP	4	3.91	2.47	1.49	1	OP	RW	4.56	CS	LL	OP	WS	36	RW
4.	W	IN	4	I	1 DO	1-5-3-6-2-4	A,B,C,D,E,F	OP	SP	3	2.94	1.66	1	1	OP	RW	4.3	CS	LL	OP	WS	35	RW
5.	Air	SE	4	I	1 DO	1-4-3-2	A,B,C,D,E,F	FS	SP	4	3.6	2.07	1.25	0.8	VW	RW	4.43	TB	TB	VW	SN	33	AW

All Engines are 4 stroke, have Aluminum Alloy Pistons, Camshaft Drives are Helical, and Electrical Equipment is 6-Volt.

A=Main Bearings
AW=All Wheels
B=Camshaft
C=Connecting Rod Bearings
CL=Cam and Lever
CS=Coil Spring
DB=Daimler-Benz
DO=Downdraft
D=Piston Pins

E=Timing Gears
F=Valve Rocker Arms
FO=Ford
FR=Front
FS=Fichtel & Sachs
HY=Hydraulic
IN=Integral
I=In Line (Cylinders)
I=In Head (Valves)

I=L-Head (Valves)
LI=Longitudinal Leaves
ME=Mechanical
G=Horizontal Opposed
OP=Opel
R=Rear
RW=Rear Wheels
SE=Separate from Cyl.
SN=Screw and Nut

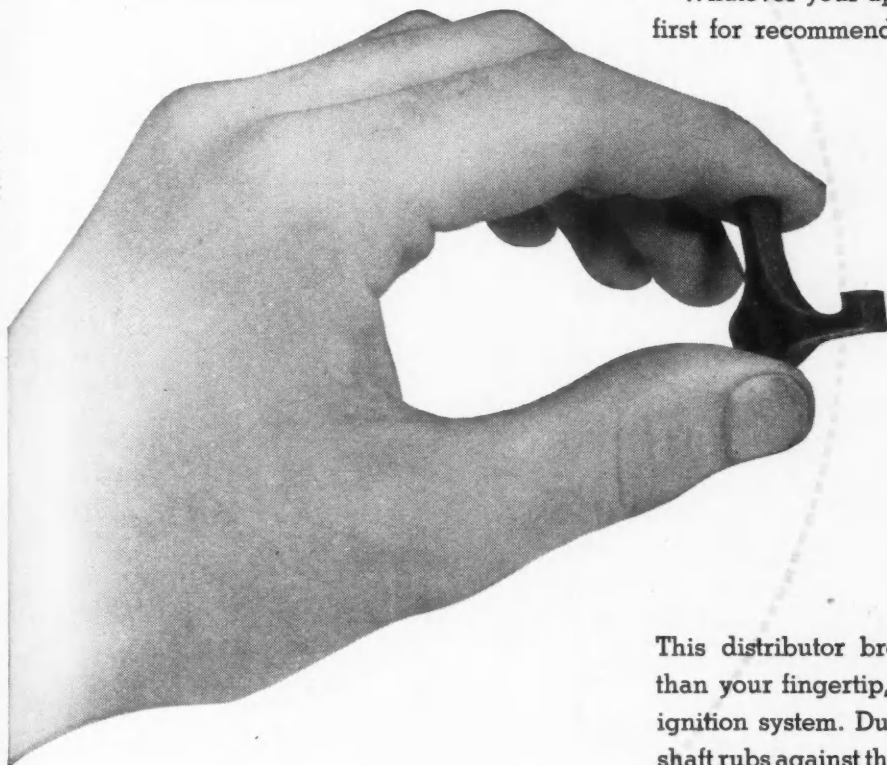
SP=Single Plate Dry
TB=Torsion Bar
TE=Teves
TL=Transverse Leaves
UP=Updraft
VW=Volkswagen
W=Water
WS=Worm and Segment

How to Increase Product Acceptance ... through New Product Advantages

One of the surest ways to increase acceptance for any product . . . is to add advantages that improve quality, appearance, and performance. To do that . . . *without increasing unit costs* . . . consider this: Continental-Diamond Plastics give you a new, unusual combination of mechanical, electrical and chemical properties. Among other advantages, they combine structural strength, light weight, electrical insulation, positive resistance to moisture, heat and corrosion. Like C-D *Dilecto* used in the application shown here, they are hard, dense, long-wearing . . . are quickly machined, at low cost.

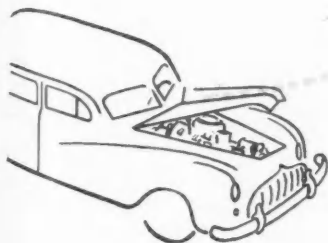
Whatever your application, see Continental-Diamond first for recommendations that lead to higher product quality and acceptance, lower fabricating costs. Your nearest C-D office has trained technicians with additional information that will interest you. Call or write, now.

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Another C-D Case of Top Performance

This distributor breaker arm blank, not much larger than your fingertip, is an integral part of an automotive ignition system. During 10,000 miles of driving, a cam shaft rubs against this C-D *Dilecto* block over 12 million times! In this application, as in a host of others, a C-D Plastic is proving its ability to provide dependable mechanical service—plus positive electrical insulation.



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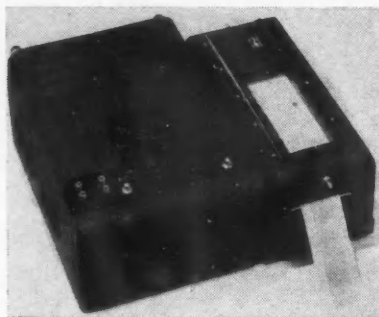
Established 1895..Manufacturers of Laminated Plastics since 1911—NEWARK 2 • DELAWARE

New Products at the Instrument Show

(Continued from page 47)

IS-20—Strain Analyzer

A direct recording strain analyzer on exhibition by the Brush Development Co., Cleveland, Ohio, records either static or dynamic strains up to 100 cps, and direction as well as magnitude of the measured strain



Brush direct recording strain analyzer

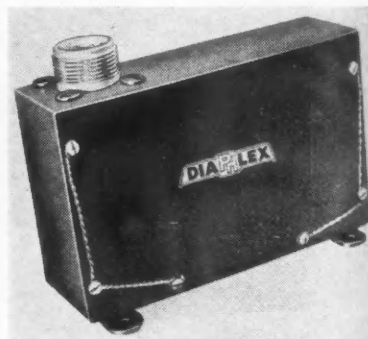
can be read from the chart. A complete package unit, this model BL-310 amplifier, when used with the Brush magnetic direct inking oscillograph, produces records immediately available and easily interpreted.

Although primarily intended for use with the SR-f 120 ohm strain gage, it is also applicable for use with any resistance sensitive pickup. The instrument can be used for record pressures, temperatures, accelerations, forces, etc., provided the equipment is calibrated in terms of the particular pickup used.

IS-21—Switch For Aircraft

A new switch incorporating 20 amp inductive low-pressure sensitivity and differential adjustment has been developed by DiaPhlex, a division of Cook Electric Co., Chicago, Ill. It has been named the "Hy-G" because of its ability to withstand high surge pressures and up to 20 G's of vibration.

The "Hy-G" is especially adaptable to aircraft use in sensing pilot tube pressures, rammed air circuits, duct



DiaPhlex "Hy-G" Switch

pressures, fuel and oil warning devices, aneroid or altitudinal pressures, cabin heating systems, and similar pressure applications for critical operating and differential adjustments. Its low differential and high amperage settings also make it adaptable to many industrial heating, ventilating, duct, and other pressure control applications.

Dimensions are only 4 3/4 by 2 1/2 by 1 1/8 in. with location of pressure and amphenol electrical connections optional. Weight of the standard model is less than 11 ounces.

The "Hy-G" switch is stable through temperature range from minus 65F to plus 160F. A relay permits multiple switching circuits, and 4 form "C" contact arrangements with suitable amphenol terminals can be provided. Contact arrangements are normally provided SPST or SPDT double make or break.

Changing the thickness of the diaphragm and restraining plate en-

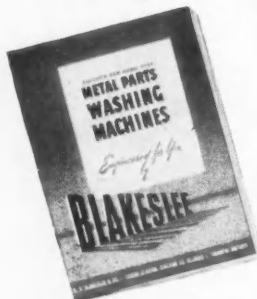


PAINT REALLY STICKS

WHEN METAL PARTS
ARE THOROUGHLY
CLEANED IN A

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METAL PARTS WASHER



Write for FREE booklet on
Blakeslee Metal Parts
Washers to answer your par-
ticular cleaning problems.

To assure 100% grease free surfaces for subsequent finishes to automobile bodies, refrigerators, washing machines, toys and hundreds of other products, choose a Blakeslee Metal Parts Washer, especially adaptable to the cleaning of metal parts prior to surface treatment. Blakeslee sprays are designed to reach all surfaces and each machine is "tailor made" to do a specific cleaning job. From our experience in handling every metal piece from small watch parts to diesel engine crankcases, we have been able to build a washing machine designed to do a perfect job and to last for years.

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You can speed up assembly operations—without danger of stretching threads or breaking bolts—by using ARO Impact Wrenches. Proper tension for each application assured by Torque Regulator on the tool. Forward or reversible . . . for Phillips, Reed and Prince, or any cross head or slotted screws . . . up to $\frac{3}{8}$ " capacity.

There's an ARO precision-built air tool to help you cut production costs from start to finish—for drilling, grinding, screw-driving, other operations. See your ARO Jobber. The Aro Equipment Corporation, Bryan, Ohio.

ARO AIR TOOLS



ROPER Series "H" Rotary PUMPS



ENGINEERED TO DO THE JOB RIGHT!

Like all Roper pumps, Series "H" models embody simplest design and principle—yet have all the refinements necessary to assure dependable, economical operation under high pressures. Spur gears provide high volumetric efficiency, and operate in axial hydraulic balance. Roller bearings and bronze wear plates—two on each side—reduce friction for handling heavy loads. Hydraulic action continuously lubricates journal and bearings.

Roper Series "H" pumps are recommended for pressures up to 1000 lbs. p.s.i. when pumping lubricating oils . . . are designed to operate at direct motor speeds. They are used widely for all types of hydraulic mechanisms, steel mill equipment, and in oil field gathering line service. External relief valves are usually recommended for all high-pressure installations.

Send for Literature

Specifications and dimensions on series "H" and other models of Roper pumps are contained in illustrated booklet. Your copy awaits your request.



GEO. D. ROPER CORP., 609 Blackhawk Park Ave., Rockford, Ill.

ables the operating pressure range to be varied from 0.1 in. H₂O to 30 psi. Twenty-eight volts DC are switched by the standard "Hy-G", but AC and 400 cycle current can be handled by changing the relay and terminals.

For high altitudes or other circumstances where switching characteristics may be affected the "Hy-G" can be supplied "Stratopaxed" by Diaphlex's method of hermetic sealing in a neutral gas atmosphere.

Other instrument show products received for publication are listed as follows according to product and company:

Electrical and Acoustical Instruments—Baldantine Laboratories, Inc.

Meters and Accessories—Ralph N. Brodie Co., Inc.

Hy-G 400 cycle relay—Cook Electric Co.

Multichannel Data Recorder System—Cook Research Laboratories

Micro-Klean filters (for instrument air service)—Cuno Energy Corp.

Dynalog Recorders, Controllers, Differential Pressure Cell Transmitters, Resistance Bulbs—The Foxboro Co.

Ring Balance Meters, Automatic Combustion Control—Hagan Corp.

Inco Nickel Alloys—International Nickel Co., Inc.

Luminous paints—Lawter Chemicals, Inc.

Micromax and Speedomax instruments (for measuring controlling and recording temperatures, pH, etc.)—Leeds & Northrup Co.

Micro ball bearings—New Hampshire Ball Bearings, Inc.

Industrial Thermometers—Palmer Thermometers, Inc.

Pivots for precision instruments—Permo, Inc.

Pilot for the Proficorder (Type RCB)—Physicists Research Co.

Pressure tubing for Bourbon gages—Precision Tube Co.

Electric instruments—Rubicon Co.

Flow Indicators, Rotameters—Schutte & Koerting Co.

Electronic voltage Regulators and Nobatrons—Sorensen & Co.

Permanent station Trafficcounters; Street-O-Matic Detector—Streeter-Amet Co.

Synchronous motors; radio preselector clocks; timers—Telechron, Inc.

Trimount instruments—Trimount Instrument Co.

Tank-measuring meters; Pressure and Vacuum Indicators—Uehling Instrument Co.

Magnetic fluid clutch; variable stiffness spring transducer—U. S. Dept. Commerce

Electrical counters—Veeder-Root, Inc.

Visi-Limit micrometers (for production testing)—Raymond M. Wilmotte, Inc.

Instrumentation Is the Key

(Continued from page 40)

gaging technique is the simultaneous measurement of bore sizes on all the cylinders of an engine. This is being done in one factory with an air system. Crank shafts and cam shafts are likewise checked with multiple gaging devices. The volume of the combustion chamber in a cylinder head, a critical factor in the new higher compression engines, is being measured with ultrasonics.

Closer tolerances have become practical with the development of automatic sorting machines. These assist in the application of the selective fit system. A number of air actuated sorting machines are in use and electronic machines are appearing. Photoelectric sorting devices have been well known for some time, but are continually finding new uses. One hundred per cent inspection of high quality parts like wrist pins, connecting rods, and bearings is now practical. Non-destructive testing methods include magnetic analysis, magnetic particle inspection, ultrasonic and radiographic techniques.

Going to assembly operations, we again get considerable assistance from the instrument man. Signal systems, for coordinating the arrival of the proper parts at the proper time and place, facilitate efficient assembly. Photoelectric devices are common for adjustment of headlights on the assembly line and control of the movement of parts on conveyors. Engine adjustment is more readily accomplished with the aid of stroboscopic instruments and exhaust gas analyzers.

Skepticism has been one of the major obstacles to the appearance of instruments in the automotive industry. This is rapidly melting away before the onslaught of records of achievement. One of the main limitations in the movement is the shortage of instrument engineers and technicians. Most of the technicians to date have actually been engineers who are interested in getting their hands into the work. As more technicians are trained, the engineers will be able to back off and get a broader view of the scene, thus expanding their horizons and the future of instrumentation. Instrument departments might be set up when properly trained personnel is available.

The outlook is extremely bright. Research is being carried on in the use of tracer techniques with radioactive isotopes. This work may furnish new fundamental information in metallurgy as well as new means of process control. Recording instruments will facilitate statistical quality control and more efficient time study. New gear testing devices are being developed. Ultrasonics, the use of high frequency sound waves, is a new field which has many uses and

unlimited possibilities. Flaw detection and thickness gaging are only two examples of applications of this new science.

Like all technological advances, the increased use of instruments will be reflected in a higher standard of living. Increasing the productivity of the worker while reducing waste, are two steps on the road to prosperity. Instrumentation will also reduce the strain on the machine op-

erator so that he can enjoy his greater buying power.

AUTOMOTIVE INDUSTRIES

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An Important Announcement From The FORD MOTOR COMPANY

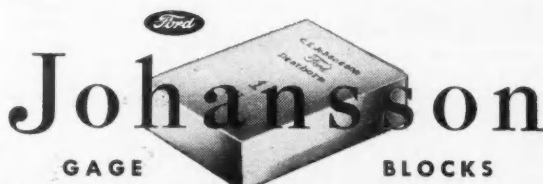
Since 1923, we have manufactured and distributed the world-famous Johansson Blocks.

We now have completed negotiations for the sale of the Johansson Gage Division of the Ford Motor Company to Brown & Sharpe Manufacturing Company of Providence, R. I. Before this transaction was completed, we gave very careful consideration to the problem of finding a company with the skill and experience that would assure continued production of Johansson Blocks to the Johansson standards of quality.

The Brown & Sharpe Manufacturing Company has 115 years of experience in the making of precision tools, and after careful study, we decided that this experience, coupled with their standing in American industry, made them the sound choice to take over the manufacture of these precision gages.

All patents, methods and machines required for making Johansson Blocks become the property of Brown & Sharpe. Machinery and special steel stocks are being moved to Providence.

Meantime we will continue to provide Johansson Blocks from available finished stock here at Ford until Brown & Sharpe are in operation and ready to supply them.



FORD MOTOR COMPANY

\$125 Billion Personal Taxes

(Continued from page 31)
of every fourteen dollars of income" was allocated for these purposes.

Distribution of Money Income Before Taxes

More people at work per family, with higher wages per worker, have produced "the most dramatic upward shift" in the nation's income distribution in its history, according to the Board. Two significant trends are clear, it is pointed out. "First, a

greater clustering of income in the middle income brackets, and second, a continuing reduction in the proportion of income received by top income groups. By 1946, the proportion of money income received by the highest fifth had declined to 46.9 per cent, as compared with 53.2 per cent a decade ago."

Retail Sales Pattern

Retail sales are about \$70 billion higher than they were in 1941, ac-

cording to the Board. Since the end of the war, it is noted, retail sales have maintained about the same position relative to disposable income that prevailed during the two decades preceding World War II. In the opening months of 1948, retail sales were "only slightly above" the long-term relationship.

Throughout the war, sales of nondurable goods "kept pace" with changes in disposable income, while sales of durable goods "were drastically limited by curtailed production." With the war's end, nondurables rose sharply above the previous "normal." Retail sales of food are found to be 45 per cent above the levels anticipated on the basis of interwar experience.

In the opening quarter of 1948, total durable sales were "still some \$7.6 billion below their normal position in relation to disposable income." In contrast, the Board points out, nondurable goods continued to be purchased at an annual rate of \$14.5 billion above their "normal."

Savings, Credit, and Money in Circulation

By the end of 1947, the Board points out, almost \$4 was in circulation for every dollar outstanding in 1939. "The total amount of coin or paper money outstanding was larger than the aggregate of currency and demand deposits (checking accounts) in 1929."

Savings again, it is noted, increased during the year, not only in life insurance but also in savings and loan accounts, "E" bonds, etc. "For these four forms of savings the net increase since 1939 exceeds \$100 billion; in 1947, the net increase was \$10 billion."

Installment sales of automobiles are "still about \$1 billion lower" than in September, 1941, while total installment credit, "despite the doubling of retail sales, is only the same as in 1941."

HANNIFIN

Right for the Job!

WHEN it's a Hannifin cylinder, it's right for the job! It's right because it is specially designed and built to meet the user's specifications. Yet in most instances, it is a standard Hannifin cylinder right out of the big Hannifin line. This is easy because the Hannifin line is COMPLETE! For users of cylinders, this means lower engineering costs... quicker delivery... complete interchangeability of parts... better design... superior performance.

It pays to specify HANNIFIN!



ABOVE—Hannifin Pneumatic Cylinder makes traversing of carriage easy and fast on this Gisholt "Simplimatic" lathe.



PNEUMATIC
Standardized
CYLINDERS

SMOOTH, FULL POWER PERFORMANCE. All Cylinders "TRU-BORED" from steel and honed to satin finish. Rods ground and polished.

SUPERIOR DESIGN. Hannifin's exclusive external adjustment featured in Series "R" Cylinders. Permits tightening piston packing without removing end caps or disturbing internal parts. Double cup piston featured in Series "LW" cylinders. External cushion adjustment provided for all cushioned models.

RUGGED CONSTRUCTION. Built to withstand hardest kind of service. Note heavy steel cylinder wall section; provides broad seat for gasket, resists accidental blows.

COMPLETE LINE. A wide choice of styles. Sizes 1" to 12", or larger. Any length stroke you specify. Single or double end rods. Cushion for head end, rod end or both. Ask for recommendations and Bulletin No. 57 W.

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Sales and
Service

HANNIFIN CORPORATION

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PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

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Readers
are always
well
Informed

Plan to Go - to the METAL SHOW!

PHILADELPHIA

OCTOBER 25-29, 1948

JOIN THE

*Salute to
Alloy Steel*

STORY OF AMERICAN ACHIEVEMENT

As a fitting climax to 75 years of progress in Alloy Steel, the American Society for Metals dedicates its 30th National Metal Congress & Exposition to "A Salute to Alloy Steel". A vast panorama of Alloy Steel production and fabrication will be presented at the Exposition. Over 100 stimulating and helpful technical papers on Alloy Steel will be delivered at the Congress.

DISTINGUISHED SERVICE AWARDS

An outstanding feature of this diamond jubilee of Alloy Steel will be the presentation of "Distinguished Service Awards" to individuals who, by research, improved manufacturing processes, experimentation, new applications and various other means, have contributed to the improvement, development and acceptance of Alloy Steel.

THE DRAMA OF ALLOY STEEL

Along with the distinguished displays of over 350 manufacturers and processors of metals and metal products will be a spectacular visualization of the 75 years progress in Alloy Steel. Occupying the entire stage of Convention Hall, this exhibit will give visitors to the Exposition the complete story of Alloy Steel. Be sure to attend!

The ENTIRE METAL INDUSTRY attends this Great Annual Event

Plan now to be in Philadelphia for the Metal Show! You'll see over 350 exhibits of new products, processing equipment and materials—actually in operation. You'll hear talks by the country's leading authorities on all phases of metal production, treatment and fabrication.

And this year, you'll be part of a gigantic "Salute to Alloy Steel", the metal industry's tribute to a great American development.

Philadelphia is a perfect setting for the 1948 Metal Show, convenient to the rich industrial East, with ample convention facilities. At least 35,000 visitors are expected—so make your plans today.

Hotel Reservations: A Housing Bureau has been set up to help you obtain reservations in leading hotels. List your requirements and send to: Charles L. Todd, Manager, Housing Bureau, Architects Bldg., 17th and Sansom Streets, Philadelphia 3, Pennsylvania.

Sponsored by American Society for Metals in cooperation with the American Welding Society, the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, and the Society for Non-Destructive Testing.

A Few Choice Exhibit Spaces still Available!

Write or Wire Collect: W. H. Eisenman, Managing Director, National Metal Exposition, 7301 Euclid Avenue, Cleveland 3, Ohio.

Phone: UTah 1-0200

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Please send me a copy of the Electric Issue of Material Handling News . . .

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Position

Firm Name

Address

THE NATIONAL GUARD DEFENDS AMERICA—JOIN NOW.

PUBLICATIONS AVAILABLE

(Continued from page 58)

complete line of Fuller Heavy-Duty Transmissions is described and illustrated in a new, 12-page catalog. It contains complete specifications on each of the unit-mounted, auxiliary and amidship-mounted transmissions in their line. Gear ratios, weights, dimensions and other installation information are listed for each of the models. Specification sheet is included.

L-68—Battery Chargers

The Electric Products Co.—Bulletin 222 describes and illustrates Multiple-Circuit Battery Chargers. Design features and specifications are included in the bulletin.

L-69—Forgings

Champion Forge Co.—An informative booklet titled Forgings—When You Want Them—gives a pictorial review of the facilities of the company's forging production facilities. A check list enables buyers, specifiers to compare their forging requirements with Champion forging service.

L-70—Collets

Balas Collet Manufacturing Co.—Catalog No. 48 contains full information regarding its line of automatic collets, pushers and pads, turret lathe collets and pads, and lathe and milling machine collets.

L-71—Hand Tachometers

Metron Instrument Co. — Metron Bulletin No. 103 describes electric hand Tachometers and accessories for speed measurements. Ranges, prices and typical applications are shown.

L-72—Pillow Blocks

SKF Industries, Inc.—The company has issued an abridged edition of its general catalog on ball and roller bearings that includes a special section dealing with the various types and sizes of pillow blocks manufactured by the company and data on their mounting, lubrication and maintenance. Considerable space is given to such engineering principles as load calculation, selection of shaft and housing tolerances and conversion tables.

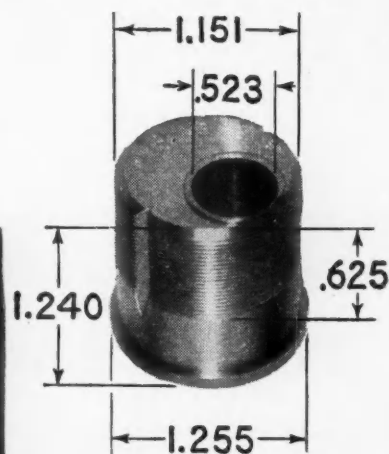
L-73—Fork Lift Truck Operators' Guide

Towmotor Corp.—A new and revised edition of the Fork Lift Truck Operators' Guide includes useful operating hints and instructions. Included also are sections on standard fork lift trucks accessories and their operation, valuable suggestions for handling materials and containers of all types.

NEW BRITAIN AUTOMATICS LOWER BREAK-EVEN POINT ON THIS PIECE ...

By

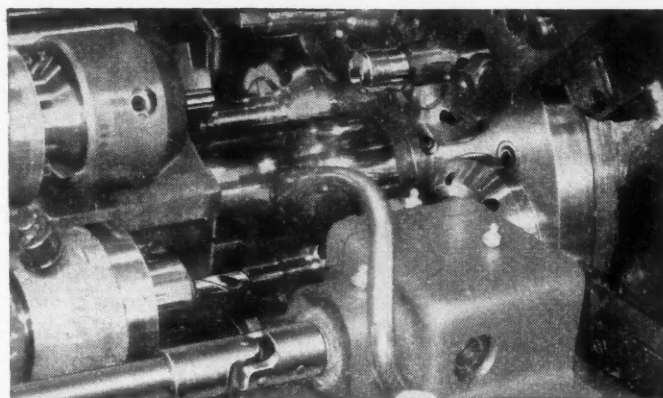
**Eliminating 2nd operations
Reducing time and labor costs
Increasing production rate over 100%
Improving quality of product
Reducing material cost**



A leading manufacturer formerly turned out the lock cylinder case illustrated from castings on five separate machines, each of which required a full time operator. Searching for more profitable production, he decided to investigate the possibility of automatic machinery.

By stopping the spindles and using eccentric drilling, plus milling attachments, New Britain engineers were able to put the entire job on one of our new model 601 Automatics using bar stock instead of costly castings. Production is maintained at 613 pieces per hour (5.8 secs. per piece), and the operator can easily take care of two other machines.

Eight operations plus cut-off are necessary to complete the piece. The spindle is stopped in the 4th position where the V slots are milled while the eccentric drilling attachment drills the main cylinder hole. Because specifications require the



closest alignment between the two slots and the eccentric hole, the spindle is indexed to the 5th position without changing the alignment. In the 5th position the main cylinder hole is reamed while a cutter faces the end of the piece leaving a shoulder around the hole.

For a practical solution to mounting manufacturing costs ... let New Britain engineers point the way to lowering the break-even point in your plant. Write today for your copy of "Cost Histories" which describes many specific approaches to more economical manufacturing.

Productivity, not price, is the measure of a machine.

NEW BRITAIN AUTOMATICS COST LESS PER FINISHED PIECE

948HC1



NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Advisory Group on Pricing Policies

(Continued from page 26)

Co.; Paul V. Doolen, A. E. Staley Mfg. Co.; David Edwards, Saco-Lowell Shops; Nathaniel B. Engle, University of Washington; Charles W. Everet, Downing Box Co.

William Fette, Jr., Schutter Candy Co.; Alexander Foster, Jr., Warner Co.; A. P. Green, A. P. Green Fire Brick Co.; Albert Goss, National Grange; Albert Haring, University of Indiana; Herschel A. Hollopeter, Indiana State Chamber of Commerce; William L. Hutcheson, United Brotherhood of Carpenters & Joiners of America; Frank A. Kemp, Great Western

Sugar Co.; Julius Klein.

Allen Kline, American Farm Bureau Federal; Leverett Lyon, Chicago Association of Commerce & Industry; Fred Maytag, Maytag Co.; James R. McCarthy, Notre Dame University; Donald G. Mitchell, Sylvania Electric Products, Inc.; Admiral Ben Moreell of Jones & Laughlin Steel Co.; Philip Murray, head of the United Steel Workers; James O. Patton, National Farmers Union.

Henning W. Prentiss, Armstrong Cork Co.; William M. Rand, Monsanto Chemical Co.;

N. D. Ruhm, Jr., Bates Mfg. Co.; William Schoenberg, United Cement, Lime & Gypsum Workers International Union; Joseph H. Sheppard, Illinois Central Railroad; Alfred Southon, Kalamazoo Vegetable Parchment Co.; Charles R. Tyson, John A. Robeling Sons Co.; E. Cloud Wampler, Carrier Corp.; S. Clay Williams, R. J. Reynolds Tobacco Co.; Ivan M. Bridges, C. E. Erickson Co.

Significant Automobile Facts and Figures for '48

Here are some interesting facts taken from the forthcoming issue of *Automobile Facts and Figures* published annually by Automobile Manufacturers Association.

By the end of 1948 more than 40 million automotive vehicles will be in use in this country, a 17 per cent increase over 1941. At the present rate motor vehicle travel in this country by Dec. 1 will total 400 billion miles this year, nearly 20 per cent more than the mileage traveled in 1941.

Of the entire U. S. population over 16 years of age, 50,586,000, or 49 per cent, are licensed drivers.

Manufacturing, sales, distribution, servicing, gas station, tourists courts, trucking and other services related to the automobile industry give employment to 8,895,000 persons, approximately 1/5th of the total national income this year will be earned by persons engaged in automotive and related activities.

Employment in factories making vehicles, parts, accessories, tires and other components is over the million mark, about 350,000 more than in 1941. In addition 600,000 are employed in industries supplying raw materials.

In excess of \$2.5 billion is being spent by states and major cities to meet highway improvement needs.

Passenger car registrations have increased 12 per cent since 1941, but by far the largest increase is in truck registrations which jumped 50 per cent.

Employment in the trucking industry today is at an alltime high, totaling nearly 5.2 million. Sixty-five per cent of the live stock gets to major markets by truck, as does 93 per cent of the live poultry, 42 per cent of the vegetables, 66 per cent of the milk, and 52 per cent of the eggs.

Ratio of vehicles to population in the United States is 1 to 4. In Russia it is 1 to 70, France 1 to 25, Great Britain 1 to 17.

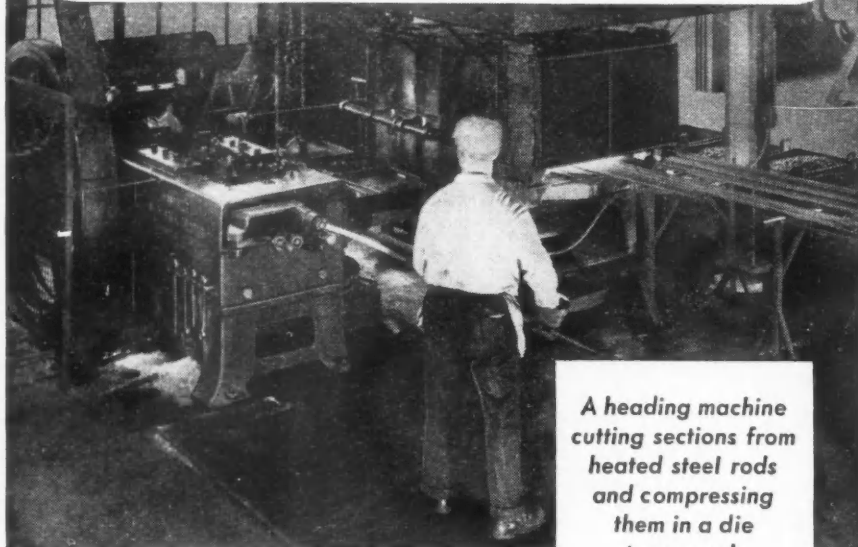
Average life of cars and trucks is now 12.75 years, compared with 10.2 years in 1941. Average miles when scrapped now is 88,550 miles, compared with 81,352 miles in 1941.

Replacement parts production currently is at the record rate of \$2.6 billion annually, compared with \$718 million in 1941.

Federal, state and local taxes on vehicle owners amount to more than \$3 billion annually, 1/3 more than in 1941. Of this amount trucks pay nearly a billion dollars.

This is How

STROM BALLS are Born

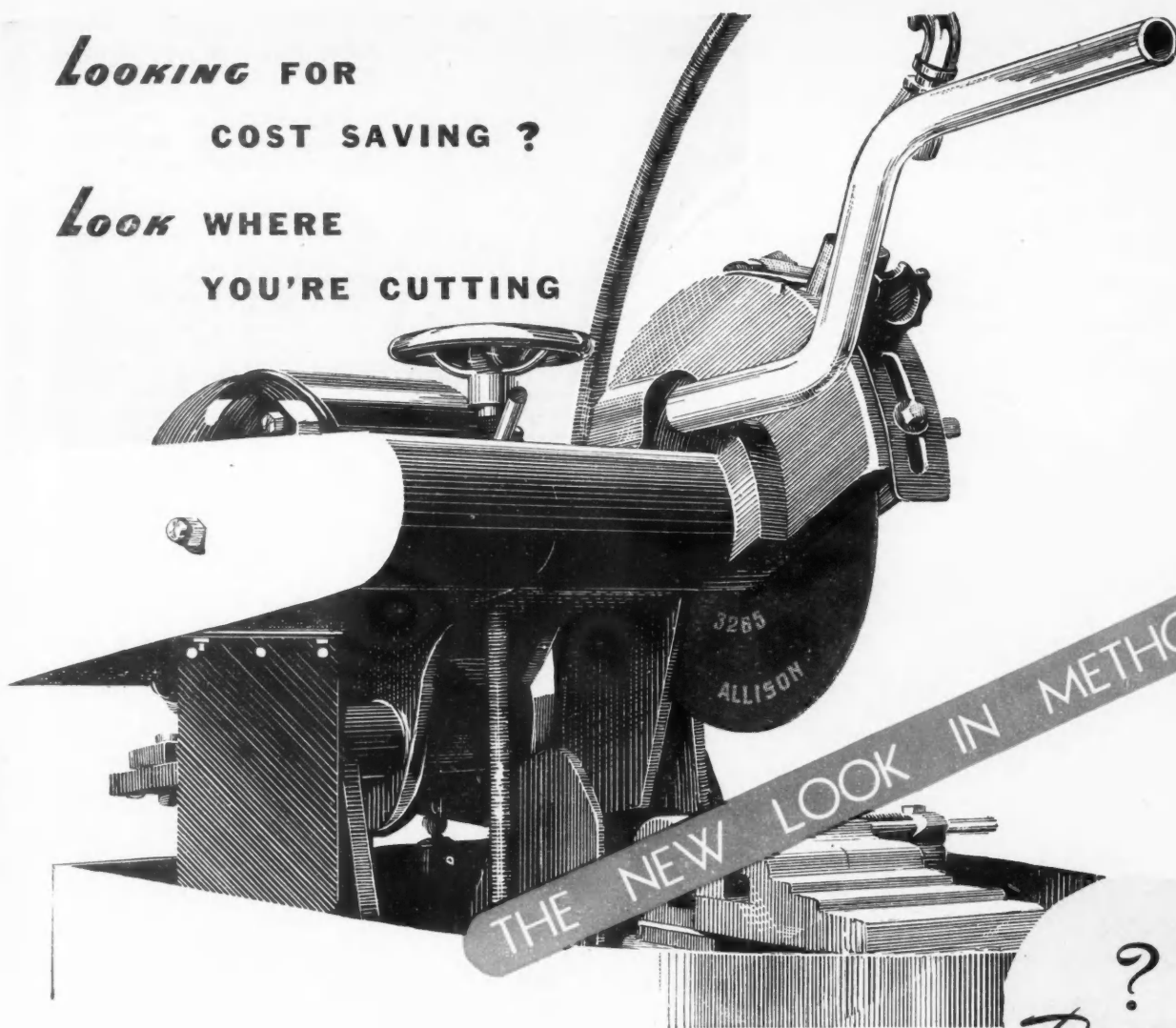


A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape

The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

Strom BALLS  **Serve Industry**
Largest Independent and Exclusive Metal Ball Manufacturer

**LOOKING FOR
COST SAVING ?
Look WHERE
YOU'RE CUTTING**



Yes, when you shift to the new look in cut-off method — abrasive cutting — you can be sure of considerable savings in the cost records you charge against your cutting operations. For regardless of the material you work with, the abrasive method means cutting time is faster, actually measured in seconds . . . it means you cut to size, within closer tolerances . . . and it means a finished surface that usually requires no further machining. Facts that add up to real savings!

As Abrasive Cutting Experts, we have had a wide experience in analyzing cutting problems and recommending equipment and wheels that have resulted in time and cost savings. If you're looking for cost savings *where you're cutting*, look to Allison.

*See Allison
IN ACTION AT THE
NATIONAL METAL
CONGRESS
AND EXPOSITION
PHILADELPHIA
OCTOBER 25-29
BOOTH NO. 705.*

Allison
ABRASIVE CUTTING WHEELS

THE ALLISON COMPANY
250 Island Brook Avenue
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Do you cut. .

BRASS
PLASTICS
MONEL METAL
GLASS
ALUMINUM
NICKEL
TUNGSTEN
IRON PIPE
TUBING
CERAMICS

IF SO, *Check*
AND CALL FOR AN

Allison
**ABRASIVE
CUTTING
EXPERT**

Personals

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

Westinghouse Electric Mfg. Corp.—**A. C. Monteith** has been elected Vice President in charge of Engineering and Research.

Westinghouse Electric Mfg. Corp.—**Hobart C. McDaniel** has been appointed Manager, Technical Press Service, Public Relations Dept., succeeding **Carl E. Nagel** who recently resigned.

Chrysler Corp., Export Div.—**S. B. Bourdreau** has been appointed Truck Sales Engineer; **Bert Machin** has been named Asst. Fleet Sales Mgr. in the Truck Sales Dept.

Ford Motor Co.—**Alton J. Hole** has been appointed Asst. to the General Manager, Highland Park Operation. **O. B. Higgins** has been appointed General Depot Mgr. of the Parts and Accessories Div.

Hudson Motor Car Co.—**Roy D. Chapin, Jr.** has been appointed Special Sales Representative for the Company, with headquarters in Detroit.

Studebaker Corp. — **Carroll W. Evans** has been made General Supt. of the main Service Parts plant.

Willys-Overland Motors — **Maurice Henchey** has been appointed an Asst. Regional Sales Manager.

General Motors Corp., Delco Appli- of Directors has elected **F. L. Burke** and **Edward R. Godfrey** members of the Board and of the Corporation's Operations Policy Committee.

General Motors Corp., Fisher Body —Ternstedt Div.—**L. B. Ragsdale** has been promoted to Senior Project Engineer on Mechanical body hardware.

General Motors Corp., Delco Appli- ance Div.—**Edward Halbleib**, General Manager, has retired. He will be succeeded by **Paul H. Rutherford**.

General Motors Corp.—**Leon F. Corp** has been appointed Acting Plant Manager, Lockport Plant, Central Foundry Div. He succeeds **Donald L. Boyes** who has been named Sales Manager, Saginaw Div.

Lima-Hamilton Corp., Hamilton Div.—**James Boyd** has been appointed General Sales Manager.

American Bosch Co.—**E. Perry Holder** has been elected Chairman of the Board of Directors. Directors elected are **W. Hubert Beal**, **William R. Crawford, Jr.**, **Arthur P. Davis**, **Herbert C. Guterman**, **F. William Harder**, **Charles G. Terry** and **William S. Wasserman**.

Curtiss-Wright Corp.—**William C. Jordan**, formerly General Manager of the Curtiss-Wright Airplane Div. has been elected Vice-President and appointed General Manager of the Wright Aeronautical Corp., the engine-building division of the company. **T. B. Focke**, formerly Factory Manager of the Curtiss-Wright Airplane Div., has been appointed General Manager of that organization, succeeding Mr. Jordan.

Boeing Airplane Co.—**Edward C. Wells**, formerly Vice-President-Chief Engineer, was elected Vice-President of Engineering. **Lysle Wood** is Chief Engineer and **N. D. Showalter** is Asst. Chief Engineer.

ACF-Brill Motors Co.—**E. J. Parker**, Vice-President in charge of Manufacturing has also been appointed Asst. General Manager of the Company.

Eutectic Welding Alloys Corp.—**Robert H. Groman** has been appointed to the Board of Regional Sales Supervisors.

The Four Wheel Drive Auto Co.—**Donald B. Olen**, formerly Chairman of the Mfg. Committee, has been
(Turn to page 78 please)



They are Standard Equipment with this truck

Sorry. We don't mean the girl. We mean those rugged Tuthill alloy-steel leaf springs. You can see two of them supporting the front end. Tuthill springs are standard equipment on this truck.

The truck is designed for desert transport work. It is built by the Four Wheel Drive Auto Co., of Clintonville, Wis. Don't let their name mislead you, however, for this truck has a six-wheel drive. Oil men use it to haul heavy oil field equipment in the Near East.

The springs are typical of the powerful Tuthill leaf springs which are used throughout the automotive industry. But whether you

have need of heavy-duty springs like these, or of light-weight springs —Tuthill provides you the ideal model for your purpose.

Tuthill springs serve you better, because they are designed better. They are carefully engineered of selected alloy steel. They are heat treated under pyrometer control. They stand up under a lifetime of road shocks without metal fatigue.

Right now—while you are thinking of it—make a note to contact Tuthill about your own springing problems. Tuthill's engineering department will be glad to assist you, and at no obligation to you, of course. Write for information.



TUTHILL SPRING COMPANY

760 W. Polk St., Chicago 7, Ill.

Quality Leaf Springs for Sixty-eight Years

rides on the champ

THE odds favor the champion. The champion got to the top by fighting his way there, by beating all challengers. That's why, in each new battle, the wise money is placed on the champ.

The champion has a record of successes; he has wise handlers who carry him through to *more* successes.

For this same reason, it does not pay to play hunches in your selection of alloy steels. Carilloy steels have a record of exceptional performance under all kinds of unusual conditions. And Carilloy's handlers — the Carilloy metallurgical engineers — are recognized authorities in the field of alloy steels.

When these engineers size up the job you have to do, they bring with them years of experience in the highly specialized field of alloy steel application. And they play no favorites because they have a complete list of fine alloy steels to pick from—bearing steels, aircraft steels, gear steels, Nitralloy steels, high temperature steels and low temperature steels, regular and special analysis steels of every kind. In any form and in any size.

So if your job requires the unusual in strength, toughness, durability, stamina, fabricating qualities—get their expert opinion. They'll help you pick the alloy steel that's right for the job and that you can put your money on with confidence.

U-S-S Metallurgical Engineers and the outstanding research organization behind them have played a leading part in the development of the triple-alloy NE steels, and in the inception and introduction of hardenability bands, isothermal transformation studies, and new and improved heat treating methods. Through constant research and experiment these experts are continually expanding the usefulness and efficiency of special steels for the special jobs of industry.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST TO COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

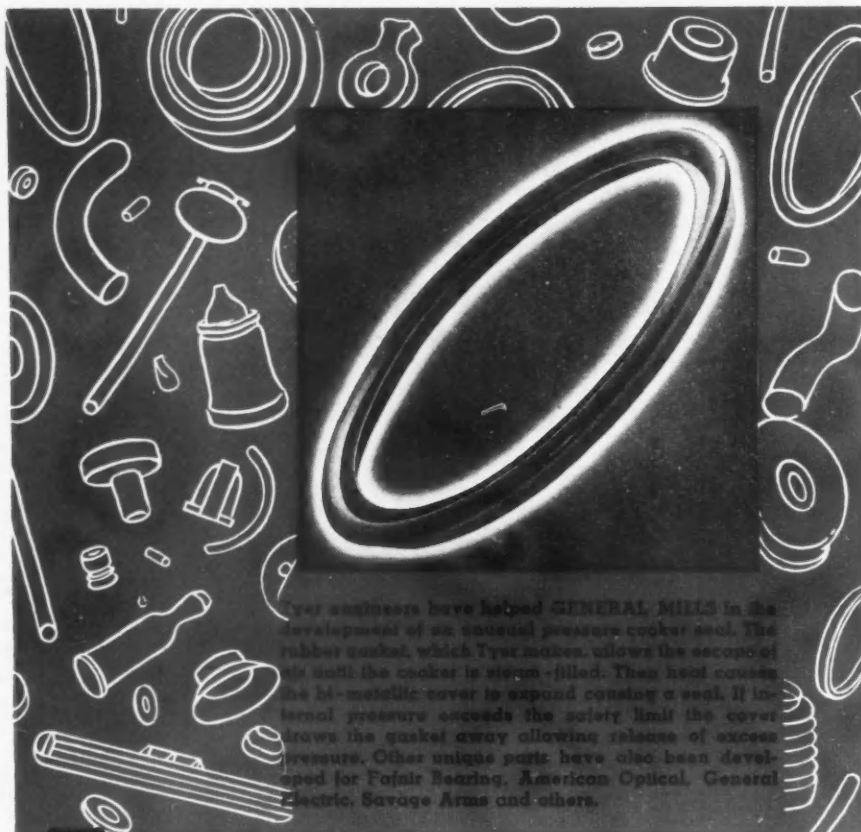
Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

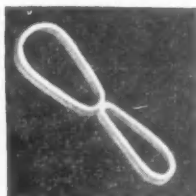


UNITED STATES STEEL



Tyer engineers have helped GENERAL MILLS in the development of an unusual pressure cooker seal. The rubber gasket, which Tyer makes, allows the escape of steam until the cooker is steam-filled. Then heat causes the bi-metallic cover to expand causing a seal. If internal pressure exceeds the safety limit the cover grows the gasket away allowing release of excess pressure. Other unique parts have also been developed for Fajair Bearing, American Optical, General Electric, Savage Arms and others.

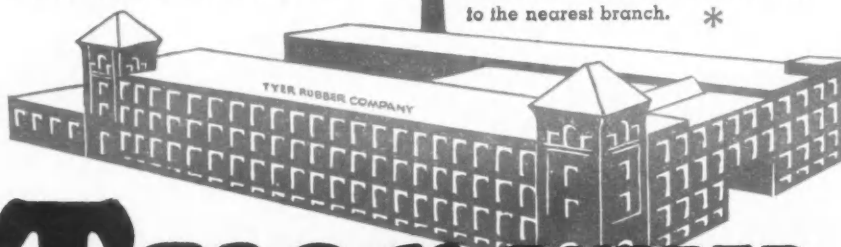
Tyer has been doing things with rubber for ninety-two years and during that time has made many contributions to the art. In earlier days Tyer originated white rubber and elastic webbing. During the late war Tyer's contributions ranged from giant rubber pontons to tiny ear plugs made to a tolerance of one thousandth of an inch. Since the war Tyer has resumed its leadership in service to industry. Many of the country's finest and most famous products have at one or



To hang copies of Shopping News on suburban door knobs Tyer makes this double rubber band.

more vital points a rubber part made by Tyer. These manufacturers know that Tyer can do unusual things with rubber.

If there is a rubber part in your product (old, new, or proposed) Tyer technicians will give you the utmost co-operation in putting all our experience at your service. Ask the Tyer representative. Write to us in Andover or to the nearest branch. *



Tyer RUBBER COMPANY

* ANDOVER, MASSACHUSETTS
159 Duane St., NEW YORK 189 W. Madison St., CHICAGO

Personals

(Continued from page 74)

named Director of the Engineering Div.; **H. B. Dodge** becomes Technical Advisor to the Management and **G. D. Simonds** has been named Chief Engineer in Charge of Design of Standard FWD models. **B. G. Donley** is manager of Development Engineering and **James A. Sorenson**, Metallurgist.

E. W. Bliss (England) Ltd.—A. E. Whyman has been elected Vice-President in charge of European operations.

Ramsey Corp.—John E. Fasano has been appointed Sales Manager of its recently created Spirolox Retaining Ring Div.

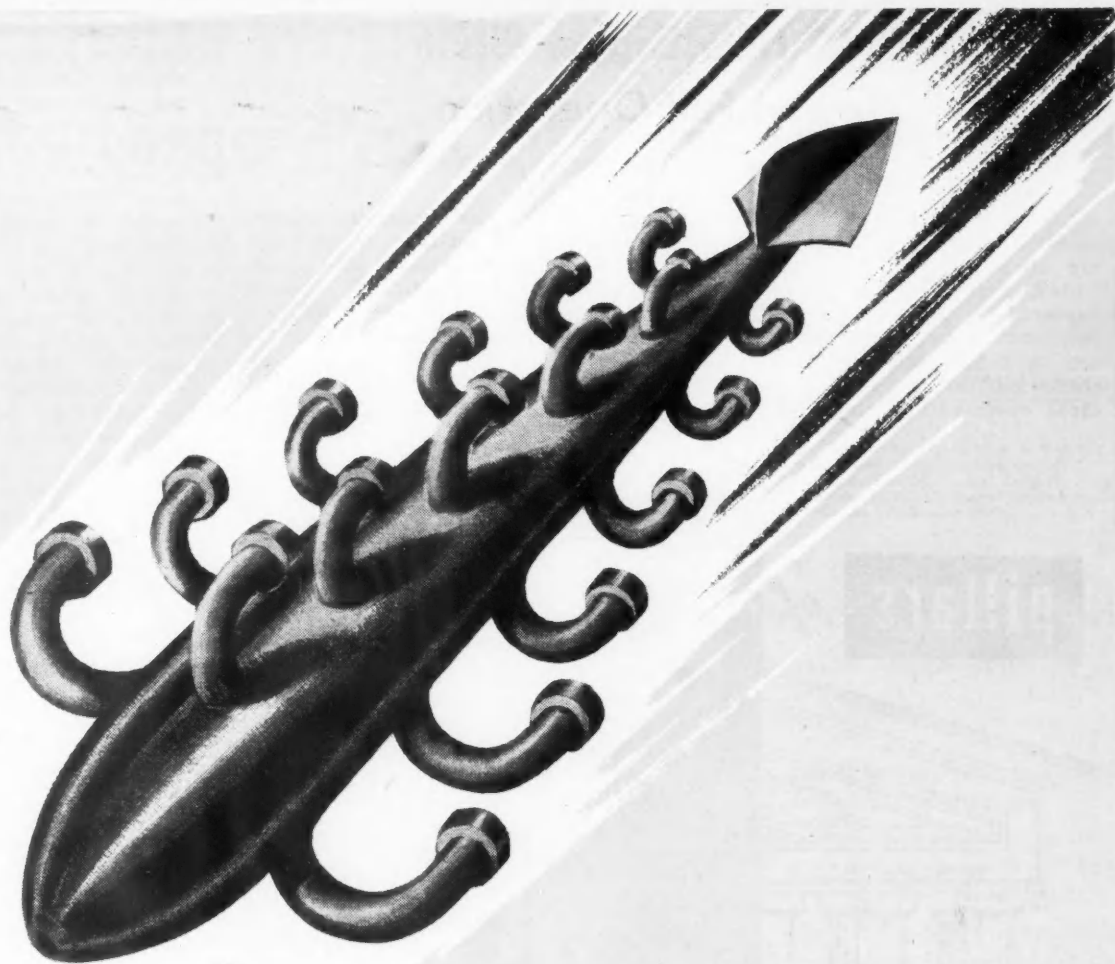
Minneapolis-Honeywell Regulator Co.—Ray R. West has been named Manager of Sales.

Chambersburg Engineering Co. — Robert L. Stubbs has been retained by the company as Cecostamp consultant.

CALENDAR

Conventions and Meetings

Natl. Air Races, Cleveland	Sept. 4-6
SAE Tractor & Diesel Eng. Mfg. Milwaukee	Sept. 7-9
Soc. of British Aircraft Constructors Annual Air Show, Farnborough ..	Sept. 7-12
International Foundry Congress, Prague	Sept. 12-19
Instrument Soc. of Amer., Natl. Instrument Conf. & Exhibition, Philadelphia	Sept. 13-17
Industrial Experimentation Training Conf., Columbia University ..	Sept. 14-18
Turin (Italy) Auto Show	Sept. 15-26
Natl. Assoc. of Foremen Convention & Silver Anniversary, Phila.	Sept. 23-25
3rd Natl. Plastics Expo., New York City	Sept. 27-Oct. 1
Commercial Motor Transport Show, London	Oct. 1-9
New England Materials Handling Exposition, Boston	Oct. 5-7
SAE Aeronautic & Aircraft Eng. Display, Los Angeles	Oct. 6-9
Paris Auto Show	Oct. 7-17
American Soc. Tool Engineers Convention, Los Angeles	Oct. 11-13
Inst. of Traffic Engineer Annual Mtg. Phila.	Oct. 11-13
Natl. Safety Council Safety Congress & Expo., Chicago	Oct. 13-22
Automobile Old Timers Annual Mtg., New York City	Oct. 19
SAE Production Mtg., Cleveland ..	Oct. 21-22
Amer. Welding Soc. Annual Mtg., Phila.	Oct. 25-29
Amer. Soc. for Metals Nat'l. Metal Congress & Expo., Phila.	Oct. 25-29
London Passenger Car Show ..	Oct. 27-Nov. 6
Society of Motor Mfrs. International Motor Exhibition, London ..	Oct. 28-Nov. 6
Amer. Soc. Body Engineers, Annual Convention, Detroit	Nov. 3-5
SAE Fuels & Lubricants Mtg., Tulsa ..	Nov. 4-5
Automotive Service Industries Show, Navy Pier, Chicago	Dec. 6-10
SAE Annual Mtg., Detroit	Jan. 10-14
Natl. Materials Handling Expos., Phila.	Jan. 10-14
Natl. Auto Dealers Assoc. Convention & Equip. Exhibit, San Francisco ..	Jan. 24-27
Automotive Access. Mfrs. Annual Expos., New York City	Feb. 7-11



A Cafluberator... Perhaps

Perhaps, but not likely will anyone ever use a Cafluberator. It's only in our imagination — to illustrate the many iron and steel cast parts, both simple and intricate, that are manufactured by C.W.C. The volume production of unusual or difficult castings is a C.W.C. specialty made possible by C.W.C.'s 40 years of casting experience, precise control of the casting process, and highly mechanized production facilities. If you have an important part that presents difficulties for casting, then *see* Campbell, Wyant and Cannon. Then you'll *know* if it *can* be cast and if it can be cast *economically*.

CAMPBELL, WYANT AND CANNON FOUNDRIES

MUSKEGON, MICHIGAN: Henry Street Plant • Sanford Street Plant • Broadway Plant
SOUTH HAVEN, MICHIGAN: National Motor Castings Div. • LANSING, MICHIGAN: Centrifugal Fusing Co.

CWC
1908-1948

40 YEARS OF FOUNDRY PROGRESS

CAMPBELL, WYANT AND CANNON FOUNDRY COMPANY
MUSKEGON, MICHIGAN

GMC New Engine Plant Now in Full Operation

(Continued from page 37)

a number of Tocco machines have been tooled for hardening cams and bearing surfaces of camshafts. As illustrated, three Tocco vertical camshaft hardening machines are installed in the heat treating department. These are used for high production camshafts and harden the camshaft in three operations. Before coming to

this machine the camshafts are gas-carburized in pit-type furnaces.

The same department has a long six-station Tocco camshaft hardening machine designed for handling large camshafts. Here they harden one station at a time, the fixtures being designed for quick change-over from one type of bearing to another.

Another interesting unit is a Schraner polishing machine for camshafts. This polishing operation is not so common for camshafts as it is for crankshafts and, consequently, is well worth noting.

Another specialized machine of more than passing interest because of its application to relatively low-production volume is the large horizontal Cincinnati Hydro-Broach for surface broaching the large end of connecting rods and caps. As illustrated, this machine is of two-station type with two sets of broaching tools on the enormous single ram. The upper tools take the flat surfaces while the lower group handles the bearing half-bore.

The machine is tooled to take one part at a time—either a rod or bearing cap—and finishes one piece in each cycle. In the interest of flexibility there are separate tools and fixtures to permit the machining of three different sets of rods and caps.

Two other unusual pieces of equipment are in use in the machine shop—Magnaflux inspection machines of high production transfer type for crankshafts and camshafts. The crankshaft inspection machine was described in *AUTOMOTIVE INDUSTRIES* over a year ago when it was first placed in operation. The camshaft machine is quite similar in design and operation.

As mentioned earlier the entire second floor is devoted to engine assembly. Here they have two main final assembly lines—one for small and medium output engines; the other for the large gasoline engines. The high production line is about 335 ft long and is capable of producing around 320 engines per 8 hr day. The big engine line runs about 165 ft in length, and produces upward of 40 engines per day. The two lines run in opposite directions, terminating at engine test stands for initial run-in and adjustments.

Serving the assembly lines are three trim lines on which the accessories and special fittings are installed, making engines ready for installation on the truck and coach assembly lines. One trim line handles the big engines, another takes care of the high-production engines, while the third is exclusively for the preparation of Diesel engines intended for coaches and trucks.

Accepted engines from the trim lines follow one of two courses—engines intended for service or for branch assembly plants are hung on a 733-ft storage conveyor which transports them to the storage racks where they are tied until scheduled for shipment. The bulk of the gasoline engines, however, are hung on the 1500-ft delivery conveyor for transport directly to the truck assembly building. Diesel engines, on the other hand, are assembled in racks and transported by industrial trucks to the two coach assembly plants elsewhere on the property.

pillars of engine performance

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TAPPETS**

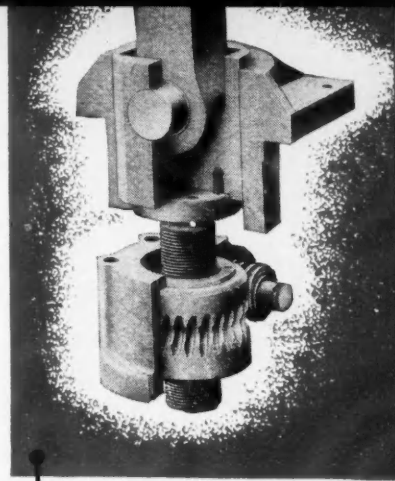
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How the Pitman Wrist-Pin Design Promotes Longer Press Life on

DANLY Presses



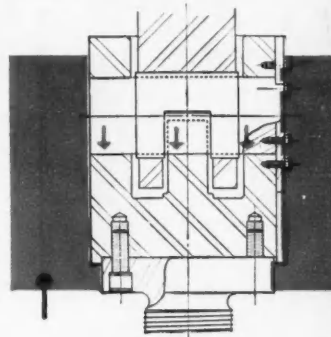
View showing pitman wrist-pin and replaceable bronze bushing, connection and slide adjustment. Long, accurate guide eliminates bending stresses in adjusting screw.

SIMPLIFIED CONSTRUCTION PERMITS ACCURATE MACHINING OF PITMAN AND SLIDE PARTS—ASSURES LONGER PRESS LIFE, LESS DOWN-TIME

Here is more proof of the care taken in designing Danly Presses to assure longer press life, less down-time.

The application of the pitman wrist-pin and the construction of the slide adjusting mechanism permits accurate machining and precision fitting of the component parts.

As illustrated, three-point support for the power stroke eliminates possibility of wrist-pin shearing, and minimizes deflection. The wrist-pin is locked in the guide of the slide adjusting unit to prevent oscillation. Wear on the pin and pitman is minimized by use of a *hardened and ground* pin, and aluminum-iron alloy bronze bushings with special properties for toughness and resistance to wear. The moving parts of the connecting assembly are lubricated by the main built-in circulating filtered oiling system.



Wrist-pin hardened and ground to precision tolerances is accurately fitted and locked in machined guide. Replaceable wrist-pin bushing of tough wear-resistant bronze alloy reduces maintenance. Three-point bearing support on power stroke prevents pin shearing, minimizes deflection.

This careful engineering of Danly Presses, the result of 25 years of association with the metal stamping industry, promotes longer press life, longer die life, higher production efficiency, and lower net costs.

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- ☐ Fully Enclosed Crown Construction.
- ☐ Extra Long Bronze Lined Slide Ways and Precision Machined Gibs.
- ☐ Safe Automatic Electrical Controls with Reverse and Anti-Repeat Feature.

Danly One, Two, and Four-Point Straight-Side Eccentric Gear Presses are available in capacities from 100 to 3,000 tons to suit your needs. High production units from 50 tons up.

Trends in Instrumentation

Continued from page 39

Surface finish of metals and plastics can be gaged or compared with known standards by reflecting light rays on the surface. Similarly, it is now possible to determine the degree of polish or sheen, of plated and painted surfaces. Electronic instruments are available for color comparison, also.

One of the most useful tools coming into wide application is a type of electronic instrument for detecting hidden flaws in castings, and for non-destructive gaging of metal

thickness, as of tubes. Internal corrosion weakening a metal part can be noted, and steps taken to arrest its progress before failure occurs.

Of invaluable aid to stress analysts are several makes of electronic type strain gages that operate on the infinitesimal variation in electric current resulting from bending a tiny hair-like wire attached to the specimen or model. Another example of the ingenuity of instrument engineers is an instrument for detecting minute traces of toxic, or explosive

gases in the atmosphere, or in a mixture of other gases. If desired, the "robot" will sound an alarm and shut-down the process if the escaping fumes reach dangerous proportions. The presence of deadly, or explosive fumes in a large garage or factory would thus be quickly discovered.

Air gaging is another recent development in production instrumentation. Dimensional tolerances of small parts are now held to closer limits and inspection has been accelerated through the use of go-no go-gages operated by a tiny stream of compressed air.

If the instruments found in the modern production shop are divided into two groups, (1) self-operated, and (2) those relying on some external source of power, the electronic and pneumatic types prevail in the second group. Other types include hydraulic, electric, vacuum, or a combination of any two or more. In the heavy industries, such as foundries, steel mills, and forge shops, the hydraulic and electric types prevail. These are represented in various systems of combustion controls for furnaces, ovens, retorts and kilns; flame failure protection; automatic temperature regulation; inert gas blanketing; and many other applications.

In the lighter industries, instrument controls are usually pneumatic in operation. The usual example is temperature control of a steam-heated process by throttling the flow of steam through a valve actuated by an air diaphragm or piston.

The instrument designer has literally hundreds of materials to draw from: stainless steels of all sorts for temperature measuring elements, diaphragms of beryllium and tantalum for pressure elements, and all the varied offerings of the plastic world for other parts; saran and mycalex for thermal insulation; hastelloy and neoprene for corrosion resistance; nylon and duprene for wear resistance.

Much could be written about "servo-s", those automatic gadgets that act on impulses sent out from a monitoring instrument to maintain a continuous balance between cause and effect. The automatic pilot in a B-29 is made up of several servomechanisms for activating the controls. Actually, servo devices are not new. The draft regulator on the old-fashioned furnace consisted of a clockwork servo, monitored by a thermostat and a timepiece. Servomechanisms in industry are opening doors at the bidding of an electric-eye, rejecting parts on automatic scales or air gages, maintaining oven temperatures by cutting down the fuel input.

Instrumentation is indeed playing a vital role in today's production race, "making better things for more people, eliminating repetitive drudgery, and making our world a better one." *

* From an editorial in *Instruments*, July, 1948



Power-Grip Holding Speeds Milling of Serrations

The job here is milling serrations on vise jaws. Work is held on a 20" Power-Grip Viking Chuck. Nineteen pieces are milled at a time and turned for cross serrations. Cutter is 4" dia. by 7 1/4". Spindle speed is at 78 r.p.m., and feed rate at 9" per minute.

Milling jobs of this type require only a simple locating fixture to adapt them to the Power-Grip Viking Chuck, and the resulting production increase is usually 300% or higher, with more uniform, accurate work.

You can quickly learn the possibilities for any job by sending us prints and operating data, so we can submit a complete proposal for Power-Grip Holding.

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CHUCKS



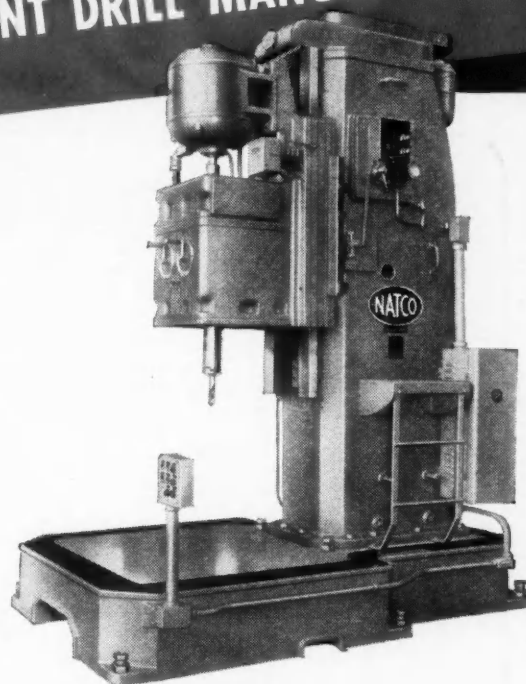
NATCO Heavy Duty Hydraulic Drilling Machine with single spindle 7-speed geared head —

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To help a well known drill manufacturer test the durability of his product NATCO produced a machine that would operate at peak efficiency under all abnormal or overload conditions. The motor on this machine maintains a synchronous speed up to the rated H. P. when drills become dull. A shear pin is provided to prevent destruction of gears in the head in the event of serious overloading. A range of 42 different speeds is provided thru change gears. The machine is heavy duty to give maximum rigidity to the column, head and spindle. As the load builds up to a predetermined value a torque limiting device operates to stop the motor.

Whether you have a special drilling, boring, tapping or facing problem or just a routine production problem involving these operations you will find it profitable to call a NATCO Field Engineer to help you. Write, phone or wire today for details on NATCO Machines that may assist you in obtaining more economical production.



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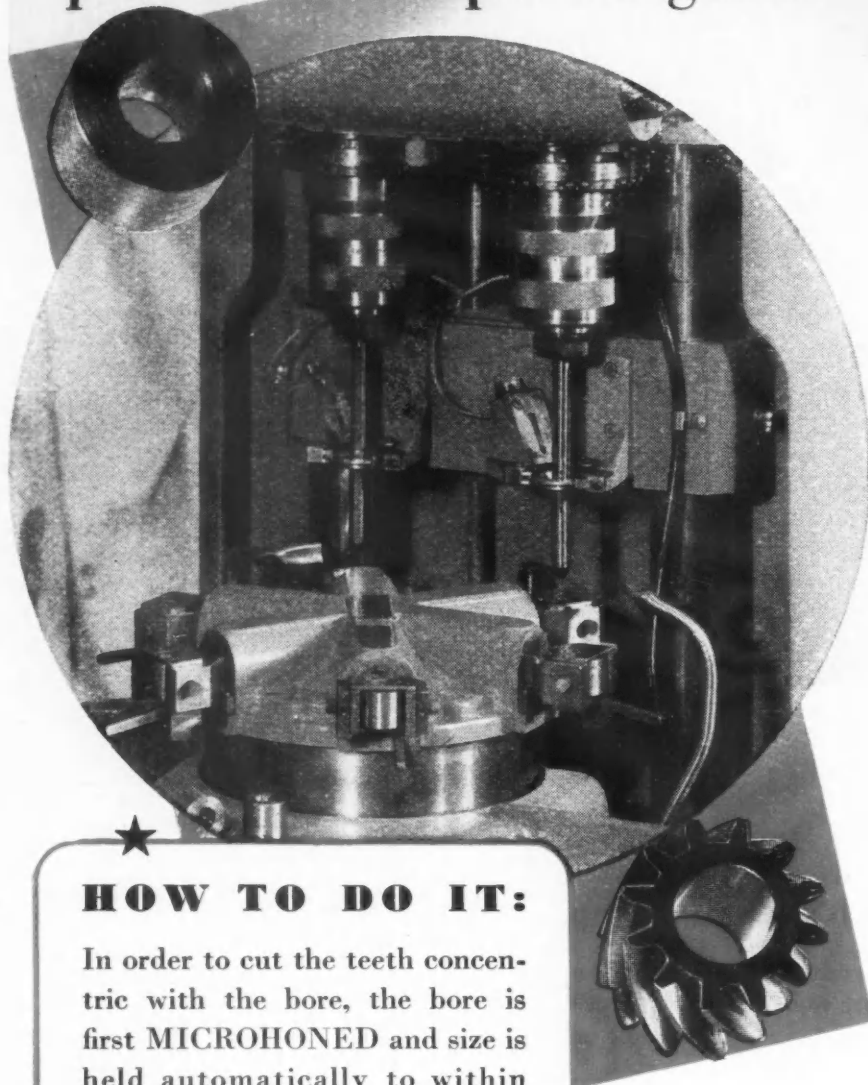
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Studebaker Plant

(Continued from page 26)

various parts while the cab is fastened securely on a fixture which is essentially a sub-frame duplicating the front end of the standard chassis.

Completed front end assemblies then are transported by hoist to the adjacent final assembly line and dropped on the chassis according to schedule sequence.

In another section of the plant to one side of the chassis assembly conveyor is the wheel and tire department where wheels and tires are assembled according to schedule. Here the wheels are painted in matching color on a mechanized line, wheels and rims being transported on a monorail conveyor through paint spray booths and dried on a trip through a ceiling-mounted Fostoria infrared heating tunnel.

Unique features of this department are the automatically-operated press for pressing the rim securely in place and the rail-guarded gravity roller conveyor for tire inflation. This latter is an outstanding safety feature since the operators at the inflation station can work in perfect security.

As the vehicles come to the end of the final assembly line, the last station takes care of front wheel alignment and headlight aiming, wheel alignment being checked by means of the familiar Bean equipment installed on each side of the conveyor.

At this point the vehicle is boarded by the test inspector who starts the engine and drives the truck onto the rolls of one of the chassis dynamometers. Here the vehicle is run at engine speeds corresponding to a standard road speed schedule, readings of road speed being indicated on a large electric speedometer mounted on a board ahead of the dynamometer stands.

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SOMETHING EVERY BEARING USER SHOULD KNOW

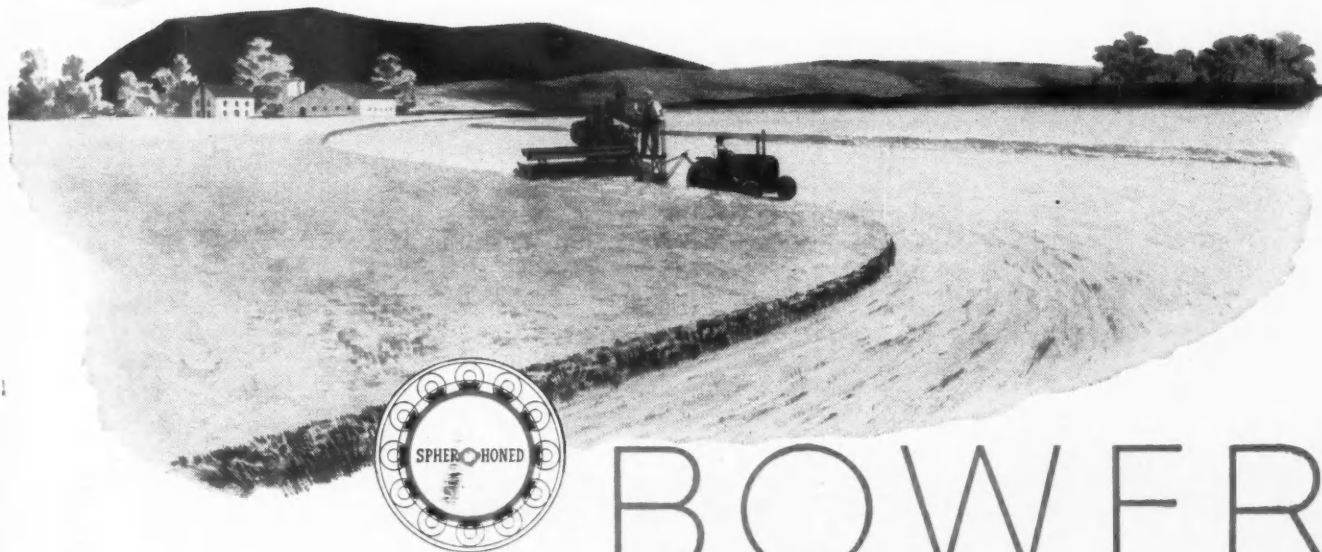
The meaning of the word Spher-O-honed is something that every bearing user should know.

It sums up important advantages that make Bower bearings unique . . . truly outstanding in the tapered bearing field. It stands for such different and greatly improved design features as spherical roll-ends and flange surfaces, the large oil groove; plus the most advanced production techniques that make possible the smooth, hard, durable races that you find in Bower bearings. In short, Spher-O-honed really means smoother performance, greater dependability, and longer bearing life for your product.

Analyze your own bearing problem in the light of these significant advantages. You'll find in almost every case that whatever your bearing requirements, Bower bearings fill them completely . . . that Bower bearings are your best bearing buy.

For more complete information, write for the new Bower engineering catalog.

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BOWER

ROLLER BEARINGS

New Type Hollow Steel Propeller

Continued from page 33

lose heat. Forming in the dies is done by bulging the shell against the die surfaces by internal gas pressure rather than by the closing of the dies, so avoiding the collapsing that would result from external forming.

Three furnaces, each with six retorts, and accommodating a shell in each retort, are mounted on rails under the press. The shell is suspended in the retort from the retort cover, held by a flexible diaphragm. A carburizing atmosphere rich in propane

is maintained in the furnaces to restore carbon lost from the surface of steel. When a shell has been fully treated in the furnace, the furnace is positioned under the opening leading up to the press dies and, with the retort cover serving as a porter, the shell is removed from the furnace, raised up and placed between the dies, and the dies are closed. The shell is then expanded against the dies by gas pressure, applied through the retort cover. The steel is harden-

ed at the same time by the cooling effect of the dies and gas. Forming is done at about 1600 F.

The internal spar serves as the stiffening member in the blade. It is made of the same alloy steel, but starts as a rough tubular forging. This is machined removing any soft skin, and is then tapered both in diameter and in thickness by a cold-rolling operation on a special machine. The open tip is flattened and welded.

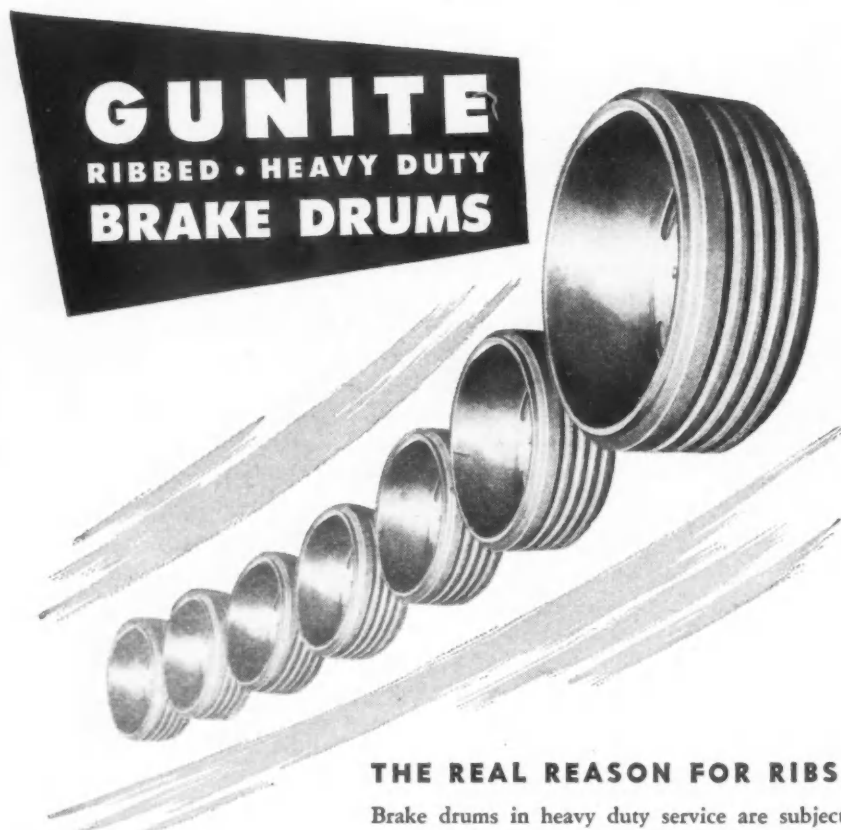
Forming of the hollow spar presents much the same problem as did the forming of the shell, and it is solved in exactly the same way. The same equipment is used in the die-forming of the spar. Time in the furnace is longer than for the shell, because of the greater thickness of metal to be brought to uniform temperature, and the retort cover is threaded so that the threaded end of the spar may be screwed into it. The furnace atmosphere is for protection only, as no carbon restoration is necessary in the machined surfaces of the forging for the spar.

One of the most difficult operations in the fabrication of the hollow steel propeller is the secure and sure joining of the spar to the shell. It was finally decided to use silver brazing for this process. The shell is cleaned carefully inside and out, and strips of foil of the silver brazing alloy are placed along the upper and lower surfaces of the spar. The shell is then slipped over the spar, and the assembly is clamped into electrically heated dies to complete the brazing. Again, internal gas pressure is used to prevent collapse of the steel walls.

Addition of the synthetic rubber filling to provide a lightweight support for the thin steel walls of the shell is one of the unique features of the new propeller. A synthetic rubber compound containing both a foaming agent and a vulcanizing agent is placed in the spaces between the spar and the shell, using strips of the uncured compound. Another feature of the design is an internal de-icing device, consisting of a network of low-conductivity wires and located along the inside of the leading edge of the shell. This replaces the rubber boot used externally along the leading edge of the solid propeller. The wire network for this internal de-icer is placed inside the shell along with the strips of rubber compound. The blade is then placed between steam-heated dies and the rubber compound is processed. Gas liberated by the foaming agent swells the strips to a porous mass that fills the cavities, and the vulcanizing materials cause this to become rigid.

The blade has now become a steel-surfaced, steel-reinforced structure with a low-density filling of foamed hard-vulcanized synthetic rubber. As mentioned before, weight saving of this composite propeller over the solid forged aluminum alloy blade is about

Turn to page 88 please



THE REAL REASON FOR RIBS...

Brake drums in heavy duty service are subject to severe flexing stresses imposed by the pressures of the shoes, tending to stretch the drum out of shape; and high temperatures, sometimes running to over 1000°. The characteristic ribs on GUNITE Brake Drums look like cooling fins but are not. Their purpose is (1) to stiffen the drum and hold it in shape against the shoe pressures, (2) to permit the use of thinner sections and thus reduce internal compressive and tensile stresses that produce "heat check", and (3) to permit axial expansion of the braking surface at high temperatures, further tending to prevent heat check and breakage. The GUNITE rib design was developed by hundreds of gruelling over-the-road tests and its effectiveness has been demonstrated by a thousand million miles of silent proof. Buy RIBBED Gunites for heavy duty braking!

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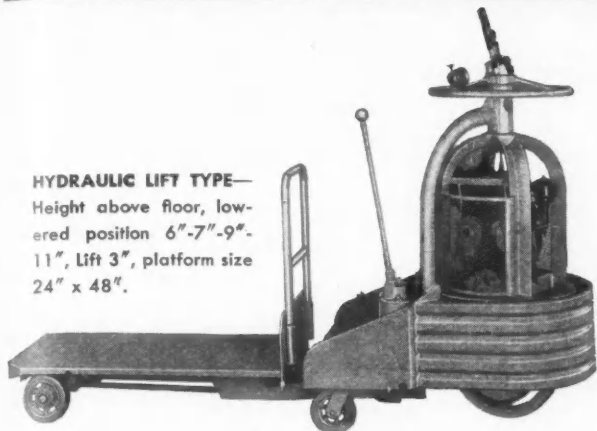


If you have Material Loads of 3,000 Pounds
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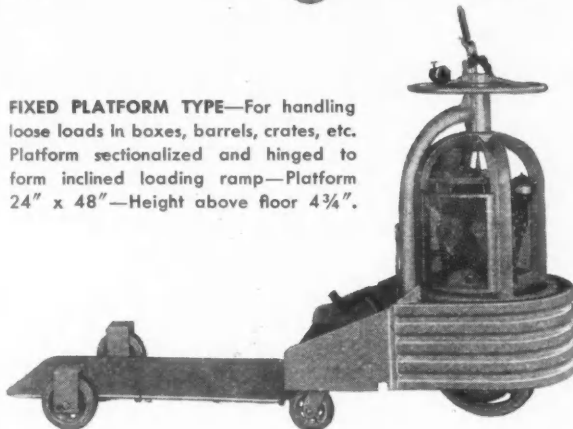
HYDRAULIC LIFT TYPE—

Height above floor, lowered position 6"-7"-9"-11", Lift 3", platform size 24" x 48".



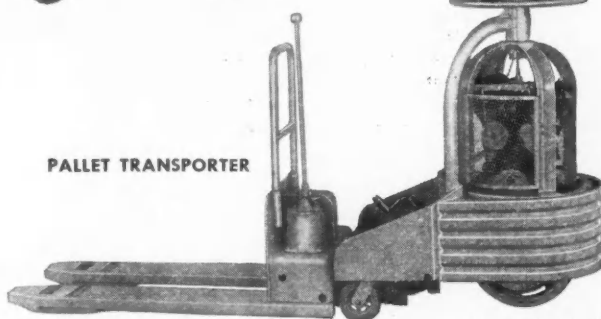
FIXED PLATFORM TYPE—For handling

loose loads in boxes, barrels, crates, etc. Platform sectionalized and hinged to form inclined loading ramp—Platform 24" x 48"—Height above floor 4 3/4".

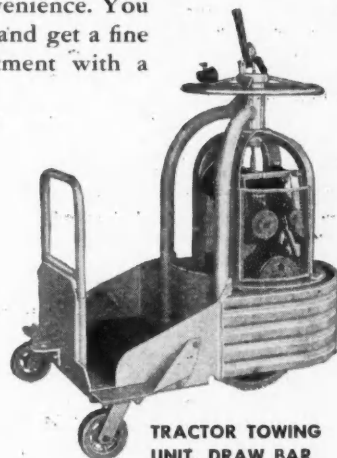


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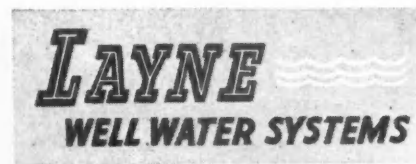
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200 lb per propeller, even with internal de-icing and an independent oil system added, in the 16-ft. 7-in. propellers used on the B-29 bomber and its non-military counterpart.

In addition to weight saving, the hollow steel construction permits a more efficient blade aerodynamically. Elimination of the rubber boot for external de-icing provides a more efficient airfoil. The wider, square-tipped blade, more efficient aerodynamically than the narrower, round-tipped formed, is impractical in a solid blade because it would increase weight considerably. Hamilton Standard's engineers feel that propellers of this type will be suitable for even higher speeds than those now used, and that the propeller will remain the most efficient means of air propulsion at speeds up to and perhaps beyond those of sound.

Rigid Aircraft Inspection

(Continued from page 42)

to the present-day aircraft inspector who is faced with the problem of verification of dimensional requirements in ten-thousandths of an inch and polished machined surfaces of extreme smoothness.

To inspect the thickness of a large area of material, the inspector now uses electronic equipment accurate to thousandths of an inch and portable for ease of handling. To obtain the required smoothness of the outside surface of the airplane, continuous tests are conducted for adhesion, and for weather and corrosion resistance properties of all types of finishes. Here again we find a specialized field requiring technical personnel and equipment.

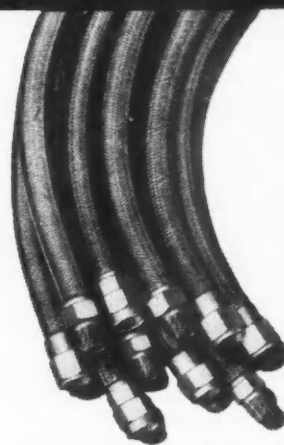
To overcome any question of specification non-conformance, all raw material and hardware (bolts, nuts, screws, etc.) require verification of chemical and physical properties prior to acceptance by the receiving inspection department. Likewise, all purchased and customer furnished equipment such as instruments, electrical units, radio and radar units, hydraulic units, etc., are tested to actual functional requirements prior to acceptance by the receiving inspector. To accomplish these tests, it has been necessary to equip and maintain complete and adequate laboratories manned by qualified personnel.

In anticipation of future inspection and test requirements, inspection is more and more turning to scientific and electronic equipment to fulfill its needs. Extensive research is being conducted in electronic equipment for the purpose of flaw detection, identification, gage consistency, and dimensional accuracy, and sufficient progress has been made to warrant optimism as to the inspector's ability to test whatever requirements the engineers feel necessary for future aircraft.



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All-Metal Tubing



Maintenance costs and replacement costs practically vanish when you install TITEFLEX flexible automotive lines. TITEFLEX is made entirely from metal to withstand high engine temperatures and resist the deteriorating effect of gas, oils, and other fluids. Fully flexible, TITEFLEX holds up under excessive vibration.

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ST. LOUIS, MO.

General News

(Continued from page 23)

Packard May Reduce Number of Shares

The Packard Motor Car Co. is considering a plan to reduce the number of its outstanding shares which currently stand at approximately 15 million. The plan will be submitted to stockholders for approval. It would entail a one-for-three or one-for-five exchange into new stock. The com-

pany is reported to have bought about 100,000 shares of its own stock in order to have it available in the company treasury for sale to shareholders who may want to bring their holdings to amounts that will be evenly divisible if the exchange plan becomes effective. It is also reported that the stock is being acquired in the event a stock bonus plan for executives is put into effect. Packard, with 15 million shares, has the second largest share capitalization of any automobile company, second only to GM.

Willys Stamps Bodies In New \$5 Million Shop

Willys-Overland Motors is now stamping bodies for the Jeepster and the Willys truck line in its new \$5 million body stamping shop. About 600 bodies a day can be stamped on a two-shift basis, and in addition to the Jeepster and truck bodies, the side panels for Jeeps, fender for the Jeep station wagon, and some engine parts are being stamped in the new shop.

Sales at Road Show Hit \$50 Million

Concrete evidence of the success of the American Road Builders Association Show held in Chicago was the estimated \$50 million worth of sales contracted for at the show. The average value of each order was over \$100,000.

Ford Assembly Plant In Pakistan

A Ford Motor Co. assembly plant has been established in Karachi, Pakistan, according to the Pakistan Ministry of Industries, which stated that a large hangar had already been erected, and that assembly is expected to start in November.

Researchers Testing Steel at Low Temperatures

The steel company research laboratories are doing extensive work in determining steel requirements for motor vehicles at arctic temperatures. Low temperature testing shows that some alloys get weaker as the temperature decreases to a certain point, and after that point has been reached, actually toughen up at very low temperature ranges.

Federal Board Changes Large Truck Specs

The Federal Specifications Board has served notice on builders of trucks of 12,500 to 14,999 lb GVW that a change has been made in performance standards. Henceforth, gradeability instead of rated horsepower will be the primary test of vehicle performance in Federal specifications. It is the first time that gradeability is included as a performance standard.

Steel for Military Trucks to Come from Makers' Stock

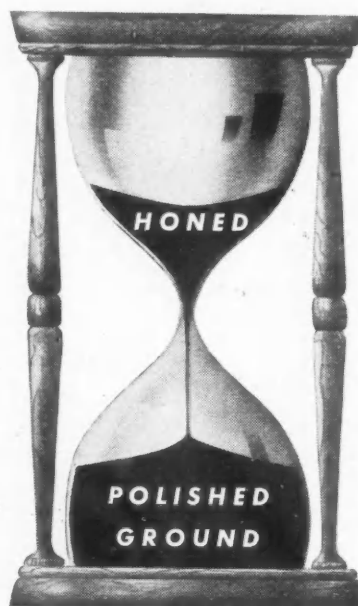
If a Commerce Dept. interpretation of the law is correct, a heavy military truck program could bite heavily into civilian production. Many truck builders have thought that if they took military orders, the required steel would be furnished to them under allotment. The Department takes a different view, however, holding that the steel would have to come from the manufacturer's own supplies. The net result would be to lower his commercial truck production by the amount of steel required for military vehicles.

(Turn to page 92, please)

HONED RACEWAYS

give HOOVER ball bearings

30% longer life



Long after the average ball bearing has been replaced, Hoover Honed Raceway Bearings will still be operating quietly, smoothly and efficiently. Hoover Ball Bearings follow the usual processes of grinding and polishing. Then comes a third step, a plus feature that only Hoover offers. The bearings are honed by an exclusive method on special Hoover machines. The result is raceway curvatures representing the closest approach to perfection in uniformity, precision and smoothness ever achieved on a commercial basis. This means life and load capacity and a degree of quietness of operation duplicated only by expensive laboratory samples. Specify Hoover Ball Bearings and secure the plus values of honed raceways.

THE ARISTOCRAT
OF BEARINGS

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America's only Ball Bearing
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HOOVER BALL AND BEARING CO. ANN ARBOR, MICH.

In Automotive, Aircraft, Marine, and Industrial Engines—EATON VALVE SEAT INSERTS are Helping to Establish Outstanding Performance Records



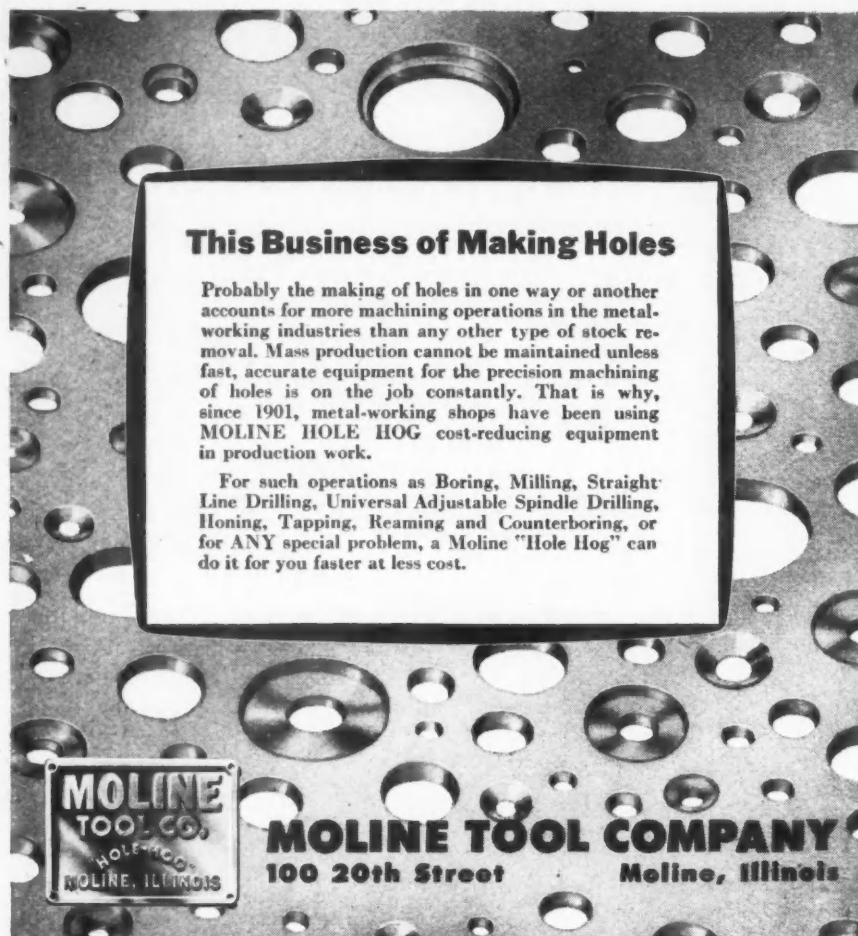
EATON

MANUFACTURING COMPANY

SAGINAW DIVISION

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Performance records show that in most types of service, properly designed valve seat inserts add materially to the efficiency and life of internal combustion engines. It has been Eaton's privilege to cooperate with leading vehicle and engine manufacturers in developing designs and installation methods which have become recommended procedure. Our engineering laboratories have also made important advancements in developing seat insert materials with superior heat, corrosion, and wear resistant qualities.



This Business of Making Holes

Probably the making of holes in one way or another accounts for more machining operations in the metal-working industries than any other type of stock removal. Mass production cannot be maintained unless fast, accurate equipment for the precision machining of holes is on the job constantly. That is why, since 1901, metal-working shops have been using MOLINE HOLE HOG cost-reducing equipment in production work.

For such operations as Boring, Milling, Straight-Line Drilling, Universal Adjustable Spindle Drilling, Honing, Tapping, Reaming and Counterboring, or for ANY special problem, a Moline "Hole Hog" can do it for you faster at less cost.

MOLINE
TOOL CO.
 HOLE-HOG
 MOLINE, ILLINOIS

MOLINE TOOL COMPANY
 100 20th Street Moline, Illinois

General News

(Continued from page 90)

Mat'ls. Handling Short Course At Exposition, Oct. 5-7

Including a short course in "Packaging and Materials Handling", arranged and conducted under the auspices of the University of Illinois, the Third Annual Industrial Packag-

ing and Materials Handling Exposition will be held in Chicago from Oct. 5-7. Among the subjects scheduled are "Automotive and Allied Industries Packaging", chairman, John Saylor, GM's Buick Motor Div.; "Car-loading-Bracing-Blocking", chairman, R. F. Weber, International Harvester Co.; "Palletizing and Loading Castings", and "Loading Engines & Service Parts in Cars and Trailers", Mel Batts, International Harvester Co.;



Shown in a raised position on page 17, this special 19.5-yd rock body is made by the Heil Co., Milwaukee, Wisc. Mounted on a Mack chassis, it is 138

in. high and 102 in. wide, and is activated by a double action Heil hydraulic hoist with twin 10 in. cyl and a 40 in. stroke.

and "Hay Baler, Tractor, Refrigerator Loading, Banding and Bracing", J. F. Wisner, International Harvester Co.

Name Baker Chairman of Aeronautics Group

Dr. George P. Baker, Professor of Transportation at the Harvard School of Business Administration, has been appointed chairman of the Committee on Aeronautics, Dr. Vannevar Bush, chairman of the Research and Development Board, announced recently.

SAE Holds Tractor & Diesel Meeting, Sept. 7-9

Presenting 13 technical papers on research reports of diesel engine combustion, fuel compositions, cylinder and ring wear, transmissions, and engines of higher efficiencies, the first combined National Tractor and Diesel Engine Meeting of the Society of Automotive Engineers will be held Sept. 7-9 in Milwaukee, Wisc.

Ford Total Expenditures Far Above 1940 Level

A comparison of expenditures for parts and materials by the Ford Motor Co. shows why the price of automobiles is so much higher now than it was before the war. In 1940 Ford spent \$447,175,782 for goods, materials, and services, while in 1947 the total expenditures for the same items totaled \$709,453,266.

Award ASM Medal for 1948 to Dr. Dow

Dr. Willard H. Dow, president, Dow Chemical Co., Midland, Mich., has been elected to receive the American Society for Metals Medal for the Advancement of Research for 1948.

Millar Retires as Board Chairman of Northrop

Richard W. Millar has retired as chairman of the board of directors of Northrop Aircraft, Inc. He will remain as a director, member of the executive committee and will be chairman of the finance committee, and has also agreed to remain as board chairman until his successor can be elected.

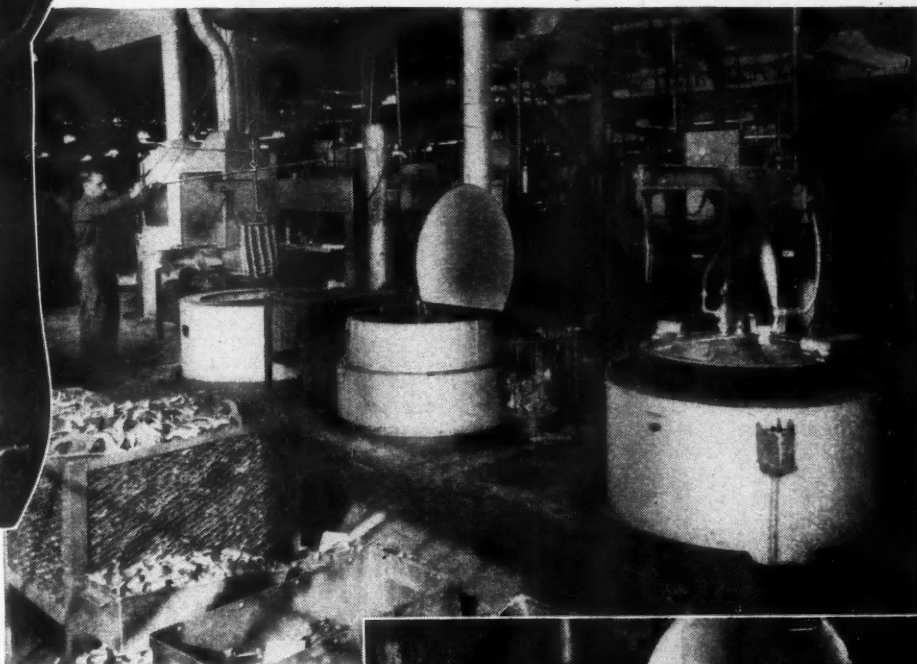
Kropp Buys WAA Aircraft Forging Plant

The Kropp Forge Co. has purchased the aircraft forging plant at Cicero, Ill., which it operated for the government during the war. The new owner will spend about \$500,000 in rehabilitating and converting the facilities over to the production of automotive, tractor and other large forgings. The plant will also manufacture aircraft parts for the Navy.

(Turn to page 94, please)



Shifter fork for transmission gear is a typical part which Clark Equipment Company gas-cyanides in Homocarb Furnaces at right.



GAS CYANIDING?

Homocarb Method Solved Problem For Clark Equipment Company

In addition to gas-cyaniding of shifter-forks, Clark Equipment Company uses its Homocarbs for lugs, brake cams and brake sectors. Case thicknesses are 4 to 8 thousandths, depending on size of parts and service requirements. Temperature is nominally 1450 F, and the parts are oil-quenched.

Clark's is a mass-production plant, and requires typical mass-production results from all equipment. Homocarb gas-cyaniding meets these specifications in every detail. It regulates the four factors of gas-cyaniding—rate of feed of cyaniding medium, circulation of medium, time and temperature. Any of these factors can be changed independently of the others, to give exactly the desired results. Operator simply loads furnace, sets its automatic controls, and forgets it until time to unload. The net cost for both investment and maintenance is only a small fraction of a cent per pound of output. Since 1939 the two furnaces have run a total of over 15 furnace-years, generally 24 hours a day and often 7 days a week.

If you have a problem in cyaniding, carburizing, nitriding, tempering or tool-hardening, there's probably an L & N equipment to meet your need. An L & N engineer will be glad to tell you what it can do. Address Leeds & Northrup Co., 4966 Stenton Avenue, Philadelphia 44, Pa.



To prepare forks for heat-treatment, they are simply slid onto the spindles of the alloy heat-treating fixture. Forks are SAE 1030 steel, and the cycle time is only 1 to 1½ hours, depending on depth of case. Tonnage per hour depends of course on size of furnace; all Homocarbs are high-production units.



MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

Jrl. Ad T-623 (28)

September 1, 1948



NEW 4-SPEED *Strandflex* FLEXIBLE SHAFT MACHINES

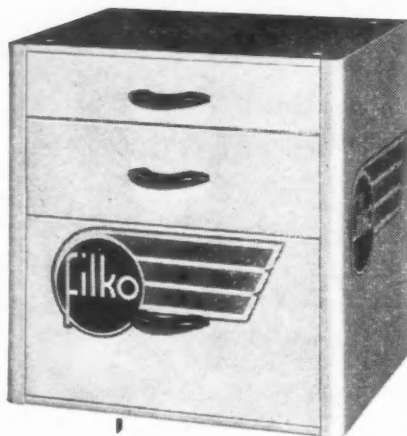
provide the newest and only outstanding improvement in Flexible Shaft Machinery in 25 years. It's another Strand step forward in quality precision tools for faster, easier and more economical production work. The Strandflex 4-Speed gear drive employs a patented, new type of quick change gear drive utilizing 4 POSITIVE speeds by a unique and easy method of instantly changing from one speed to another. Powered with totally enclosed ball-bearing motors (having speeds from 850 to 9000 R.P.M., depending on motor) means years of smooth, trouble-free service. Send for Bulletin No. 43-A for full details.

Standard 3 speed counter shaft type Strand machines also available for portable rotary power at constant speeds for grinding, buffing, drilling, wire brushing and rotary filing, in all types and models from 1/8 to 3 H.P.—for every specific requirement. Send for Catalog No. 30.

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Focus attention at the point of sale with Central's custom-built "spot" merchandisers. They identify your product, create a desire for it . . . and sell! Any size, shape or style can be created for you by our master designing department . . . creators of metal merchandisers and displays for top manufacturers for over 36 years.

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General News

(Continued from page 92)

Ryan to Develop Jet Target Plane

The Ryan Aeronautical Co. has been awarded a contract by the USAF and Navy for the development and manufacture of a service test quantity of the XQ-2, a high-speed, jet-powered pilotless target plane.

Study Analyzes Engineering Registration Laws

Said to be the first comprehensive study of the laws governing the registration of professional engineers, the *Professional Registration Laws and the Engineer* by Dr. A. M. Sargent, Detroit, Mich. is to be made available shortly. Remedies and revisions are suggested by Dr. Sargent who points out the good and bad features of existing laws.

Old Timers Ninth Annual Meeting, Oct. 19

The ninth annual meeting of the Automobile Old Timers will be held in New York City on Oct. 19.

Mac Short

Mac Short, 51, vice-president, Lockheed Aircraft Corp., and a past president of the Society of Automotive Engineers, died on August 13, in Burbank, Calif.

Fred W. Letts

Fred W. Letts, 50, general superintendent, GM's Buick Motor Div., died in Flint, Mich. on August 18.

Albert R. Benson

Albert R. Benson, 49, secretary, Stewart-Warner Corp., died on July 31 in Chicago.

George C. Collins

George C. Collins, 51, fleet sales manager, Service Div., Thompson Products, Inc., died on August 14, in Columbus, O.

Samuel W. Rushmore

Samuel W. Rushmore, 77, noted inventor, automotive engineer and manufacturer, died in Plainfield, N. J. on August 16, 1948.

Morrill Dunn

Morrill Dunn, 77, vice president of the McCord Corp., Detroit, died August 7 in Ontario.

Emerson Brooks

Emerson Brooks, 87, former automobile body maker and treasurer of the Automobile Club of America, now known as the American Automobile Association, died in Trenton, N. J. on July 23.

H. Stanley Binns

H. Stanley Binns, 58, chairman of the American Society for Metals and head of the metallurgical laboratory of the Cincinnati Milling Machine Co. died in Cincinnati, O. on July 21.

Richard E. Merrell

Richard E. Merrell, 58, a sales executive of GM's AC Spark Plug Div. died in Chicago on July 29, 1948.

AUTOMOTIVE INDUSTRIES

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